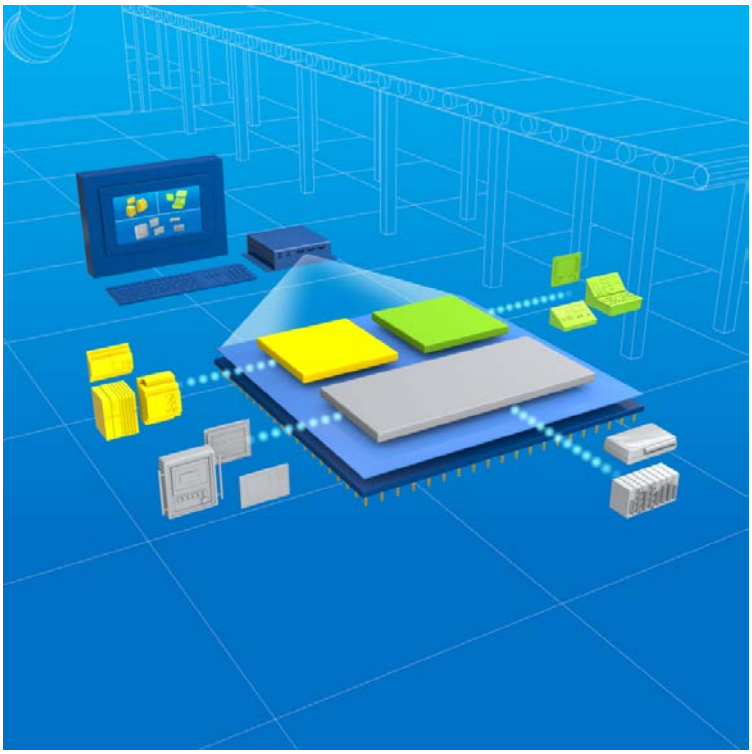
Intelligent Systems

Intel® Industrial Solutions System Consolidation Series User's Guide for v. 1.0b

For SCS 111K Development Kit Based on v. 1.0b

August 2014



Document #550658-1.0

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Contents

Figures

Tables

Revision History

Date	Document Version	Description
August 2014	1.0	Official first release for Intel® Industrial Solutions System Consolidation Series (SCS) 111K product version 1.0b.

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1 Introduction

This document is written for use by system developers including embedded system developers. This content assumes advanced knowledge of installing and configuring hardware and software for personal computer systems. Engineers using this document should be familiar with the use of and programming of:

- Wind River* Hypervisor
- Wind River Linux*
- Wind River VxWorks*
- Wind River Workbench
- Microsoft* Windows* 7

IMPORTANT: Read and understand this document in its entirety before setting up the system, installing software, and starting the system.

IMPORTANT: This content may be updated without notice. To ensure that you are reading the most recent document, check the product support website:

www.intel.com/industrialconsolidation

Upon downloading a copy of the *User's Guide* from the website, compare the cover page date of the downloaded document to the *User's Guide* you currently have.

1.1 Terminology

Table 1 – Terminology

Term	Description
Development host	The portion of the SCS system used for development. Configurations created on the *development host* are loaded from the *development host* onto the *target platform* to realize productivity.
Intel® Industrial Solutions System Consolidation Series	Intel® Industrial Solutions System Consolidation Series is also sometimes known by its shorter name, SCS.
PC	Personal computer
SCS	Intel® Industrial Solutions **System Consolidation Series**

Term	Description
System	The Intel® Industrial Solutions System Consolidation Series *system* comprises two subsystems: • Target platform • Development host with Software Features For detailed descriptions of these items, see Section 6 - Workflow 1: Set Up & Explore the System Features.
Target platform	The portion of the SCS system used for productivity. Configurations created on the *development host* are loaded to the target platform for productivity.
User-provided	This term refers to certain items that the user must provide at the user's expense. For more information, see Section 4 - User-Provided Items.

1.2 Product Literature

You can order product literature from the following Intel literature centers.

Table 2 – Product Literature

Location	Contact Information
U.S. and Canada	1-800-548-4275
U.S. (from overseas)	708-296-9333
Europe (U.K.)	44(0)1793-431155
Germany	44(0)1793-421333
France	44(0)1793-421777
Japan (fax only)	81(0)120-47-88-32

1.3 Reference Content

Contact your Intel Field Representative for assistance in acquiring the latest version of these documents.

Table 3 – Reference Documents

Document	Document No./Location
Intel® Industrial Solutions System Consolidation Series User Guide	This is the document you are reading now, available in PDF format on the *User Support* media USB that comes with the product packaging. (Doc #: 550658)
User Support Documents	See the full listing of user support documents in Section 3 – Intel® Industrial Solutions System Consolidation Series Documentation.
Other product documentation	Get other product documentation by consulting with www.intel.com and/or your Intel Corporation sales representative.
Make certain to check the product support website for supplemental information and updates to this document.	www.intel.com/industrialconsolidation

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2 Safety Notice

This safety notice summarizes information basic to the safe operation of the equipment described in this manual. The international symbol displayed below is a reminder that all safety instructions should be read and understood before installation, operation, maintenance, or repair of this product. When you see the symbol on other pages, pay special attention to the safety information presented. Observance of safety precautions will also help to avoid actions that could damage or adversely affect the performance of the product.

Do not attempt to perform any procedure before carefully reading all instructions. Always follow product labeling and manufacturer's recommendations. If in doubt as to how to proceed in any situation, contact your Intel Corporation representative.

2.1 Alerts for Warning, Caution, Important, and Note

2.1.1 WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. It may be used to indicate the possibility of erroneous data, loss or destruction of data, or device malfunction.

2.1.2 CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. It may be used to indicate the possibility of erroneous data, loss or destruction of data, or device malfunction.

2.1.3 IMPORTANT

IMPORTANT is used for comments that add value to the step or procedure being performed. Following the advice in the Important section adds benefit to the performance of a piece of equipment or to a process.

2.1.4 NOTE

NOTE is used to call attention to notable information that should be followed during installation, use, or servicing of this equipment.

2.2 Safety during Installation and/or Maintenance

The target platform is designed to be repaired and serviced by a designated service representative. Any repair, servicing, or modification of this equipment that requires removal of any covers can expose parts and involves the risk of electric shock or personal injury. Make sure that the power switch is off and the product is disconnected from the main power source. Refer servicing to qualified personnel.

See further safety information in the documentation that comes with the target platform.

2.3 Safety Related to Data Preservation

CAUTION: Intel® Industrial Solutions System Consolidation Series (SCS) provides development software that you will install onto a user-provided computer called a *development host*. Installation of the SCS software onto the development host will delete all existing hard drive contents. Make certain to back up any contents before installing the development host software. Failure to do so will result in loss of the data on the hard drive.

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3 Intel® Industrial Solutions System Consolidation Series Documentation

For information about installing and operating Intel® Industrial Solutions System Consolidation Series (SCS), see:

- **Intel® Industrial Solutions System Consolidation Series (SCS) Startup Guide (Doc # 538055) –** This is a printed document that comes with the Intel® Industrial Solutions System Consolidation Series (SCS) package. This document also comes as an Adobe-formatted PDF document on the *User Support* USB media found within the Intel® Industrial Solutions System Consolidation Series (SCS) package. This document has a serial number on the top left of the page that you will use to license the software. See Section 6.6 - License the System.
- **Intel® Industrial Solutions System Consolidation Series (SCS) User's Guide for v. 1.0b (Doc # 550658) –** This is the guide you are reading now. This is an Adobe-formatted PDF document that comes with the *User Support* USB media found within the Intel® Industrial Solutions System Consolidation Series (SCS) package.
- **MXE-5300 Series Fanless Embedded Computer User's Manual –** See this resource for information regarding the target platform hardware.
- **Wind River Development Host Help –** Access various help resources after booting the development host platform on the *Development Host* media USB. After booting and agreeing to the license information, the development host loads to a Linux OS environment. From there, go to **Applications > Wind River Documentation** and choose from the help resources available there.
- **Wind River Workbench Help –** Access various help resources after opening the development host software, Wind River Workbench. After clicking the Wind River Workbench icon, the development host system loads Workbench. Go to **Help** and choose from the information resources listed there. Further resources are available at www.windriver.com.

  NOTE: The development host includes a specially modified version of Wind River Workbench development software with features designed only for use with Intel® Industrial Solutions System Consolidation Series (SCS). The resources available from the Workbench help mentioned above may cover features not available on Workbench for SCS. For access to a full-featured version of Wind River Workbench, please contact Wind River Systems at www.windriver.com.
- **Intel Corporation Resources –** Make certain to contact with your sales and support representatives regularly. Also check for product updates, new products, and other resources on Intel's website at www.Intel.com.
- **Target Platform Documentation –** See *MXE-5300 Series 5301/5302/5303 Fanless Embedded Computer User's Manual* that comes as a printed document with the target platform packaging.

- **Licenses:** Access an important *Wind River Linux 5.0 Third Party License Notices* document by going to the following relative path on the development host media:

  …/home/wruser/WindRiver/legal-notices/wr-Linux-5.0.1/
  WindRiver_Linux5.0_ThirdPartyNotices_v2.1.pdf

  Access other license documents by going to the following relative path on the development host media:

  …/home/wruser/WindRiver/licenses

  IMPORTANT: Make certain to read important information regarding GNU General Public License version 3 (GPLv3) and GNU General Public License version 2 (GPLv2) in the *Wind River Linux User's Guide*, page 112. Access this document as an Adobe PDF file by going to the following relative path on the Development Host:

  …/home/wruser/WindRiver/docs/extensions/eclipse/plugins/com.windriver
  .ide.doc.wr_linux_5/wr_linux_users_guide/
  wr_linux_users_guide_5.0.1.pdf

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4 User-Provided Items

4.1 Required User-Provided Items

The following sections define the required user-provided items for use with Intel® Industrial Solutions System Consolidation Series (SCS).

4.1.1 Development Host

While a fully configured target platform is able to operate as a standalone system, Intel Corporation recommends a direct and permanent connection between the target platform and the development host PC. A direct serial connection enables immediate monitoring of all guest operating systems on the target platform via the development host console.

Alternatively, after some configuration, users can log in to guest OSes via Ethernet, SSH, and telnet.

4.1.2 Development Host Specifications

CAUTION: Intel® Industrial Solutions System Consolidation Series (SCS) development software installs onto a *development host* computer that you provide. Installation of the SCS software onto a disk mounted on the development host will delete all existing storage disk (hard drive) contents. Make certain to back up any hard drive contents before installing the development host software. Failure to do so will result in loss of the data on the storage disk.

The Intel® Industrial Solutions System Consolidation Series (SCS) is comprised partly of a development host, which is hardware you must provide. The development host platform may be a desktop or laptop PC.

When selecting a development host PC, make certain that it meets or exceeds the specifications defined below:

- IBM PC-based PC, Intel® Core™ i3 processor
- 200 GB storage disk space
- 4 GB RAM
- One unused USB 2.0 port, USB 3.0 preferred
- Keyboard and mouse (for development host, if using a desktop PC)
- Keyboard (for target platform)
- Monitor capable of displaying 1024 x 768 @ 16 bpp or better (for development host)
- Monitor with DVI-I connector (for target platform)

- DB9 (RS-232) serial connector port
- One gender changer serial cable adapter
- One null modem serial cable adapter
- A network interface card (NIC), for debugging the target platform over Ethernet
- Internet connection

4.1.3 User-Provided Software for Target Platform

It is the sole responsibility of the customer to purchase Microsoft* Windows* 7 Pro (64-bit) and the appropriate licensing for the product for use on the target platform.

4.2 Optional User-Provided Items

The following are optional items you may provide while using SCS. This list is not all-inclusive.

- **Ethernet Connectivity –** Connect to the Internet to receive critical updates and other information about SCS at www.Intel.com.
- **Uninterruptable power source (UPS) –** Depending on electrical supply reliability and quality, optionally connect the SCS chassis and development host to a power source protected by a UPS.

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5 Development Workflows

The Intel® Industrial Solutions System Consolidation Series (SCS) development host uses *Wind River Workbench* as its primary development tool. Some typical workbench activities or *workflows* are described in the following section.

5.1 Summary of Workflows

The Workbench platform can be used for innumerable development activities. This User Guide identifies two common development workflows to demonstrate the Workbench environment in action.

IMPORTANT: First read and then perform workflows in their chronological order within this User Guide.

The workflows are:

- Workflow 1: Set Up & Explore the System Features
- Workflow 2: Develop With Preloaded Workbench Projects

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6 Workflow 1: Set Up & Explore the System Features

6.1 About This Chapter

Before you begin using Intel® Industrial Solutions System Consolidation Series (SCS) for development and production, use this chapter to familiarize yourself with the system.

IMPORTANT: This chapter is *Workflow 1*, the first of two *workflows* in this document. Make certain you *complete this workflow first* before proceeding with the other workflow chapter that follows. Perform the workflows in their order in this User Guide.

This chapter includes both system *background information* and *instructions*.

- FIRST… Read and understand this chapter entirely.
- THEN… Re-read the chapter and perform the instructions in the workflow.

6.2 System Introduction

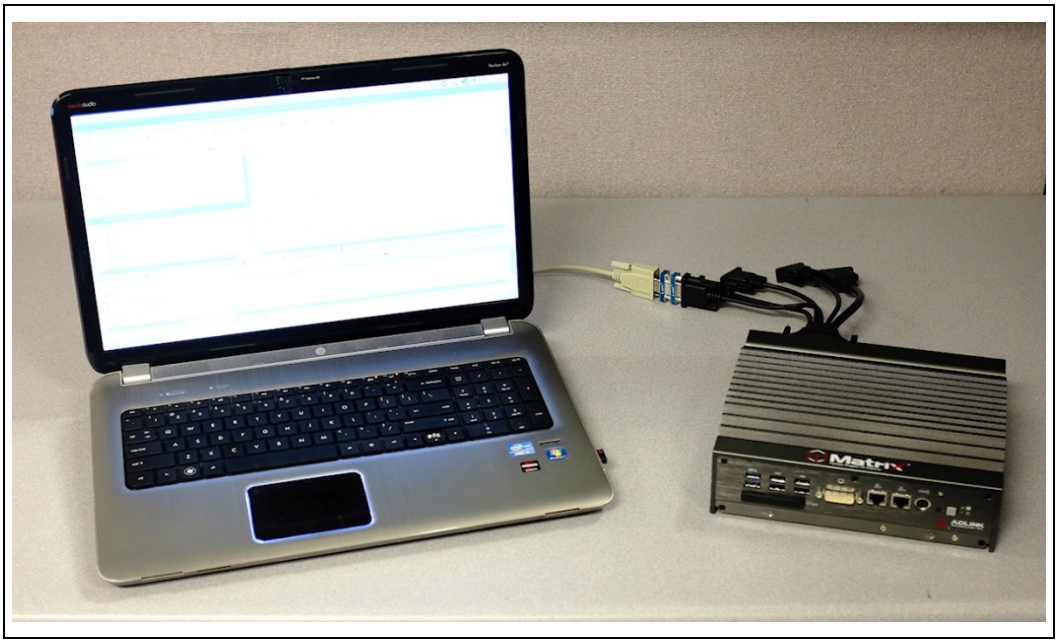
The Intel® Industrial Solutions System Consolidation Series (SCS) encompasses two subsystems: the *development host* (a PC provided by the end user) and the *target platform* (see Figure 1 – SCS Target Platform Box Shipment).

Figure 1 – SCS Target Platform Box Shipment

These two subsystems work together to provide you with development and productivity that you can customize for your needs.

As an example of the system in its simplest form, Figure 2 – Development Host and Target Platform System shows a laptop as a development host connected by a serial cable to the target platform. Optionally connect the subsystems remotely by Ethernet.

Figure 2 – Development Host and Target Platform System



NOTE: To render clarity in the figure, power supplies and external peripherals are removed. You may connect external peripherals such as a monitor and keyboard to enable interaction directly with the target platform via Microsoft* Windows*.

Before you begin, make certain to read and understand this chapter prior to assembling and exploring your Intel® Industrial Solutions System Consolidation Series (SCS) system.

6.3 User-Provided System Components

You must provide certain components to complete assembly of the SCS system:

- **Development host computer** perhaps a desktop, laptop, or tablet PC. When selecting a development host PC, make certain that it meets or exceeds the specifications defined in Section 4.1.2- Development Host Specifications.

NOTE: The SCS packaging provides a serial cable dongle to connect the development host to the target platform. Depending on your development host's hardware, you may also need to supply a male-female serial adapter to establish connection.

6.4 Target Platform Subsystem Overview

The SCS target hardware is a rugged software-controlled platform optimized for industrial productivity. See Figure 3 – The SCS Target Platform Hardware. For more

information about the hardware, see the documentation within the target platform packaging.

Figure 3 – The SCS Target Platform Hardware

The SCS target platform solid-state drive (SSD) comes preconfigured with a set of software which you either can modify live via a remote connection from the development host, or by overwriting the system OSes with a bootable image (loaded to a USB) that you create using the development host.

SCS uses Wind River* Hypervisor 2 to control, monitor, and develop for the target platform's virtual machines. While the target platform hypervisor defines hardware access to specific virtual machines, the development host has a limited ability to modify access to virtual machine resources. For example, a network interface may be configured as visible only to the Linux* platform while invisible to the other operating systems. You may learn to modify some of these hardware configurations.

The SCS target hard drive comes loaded with three virtual machine (VM) platforms as independent operating systems.

- One instance of Wind River Linux 5 OS
- Two instances of Wind River VxWorks* 6.9 Real-Time OS

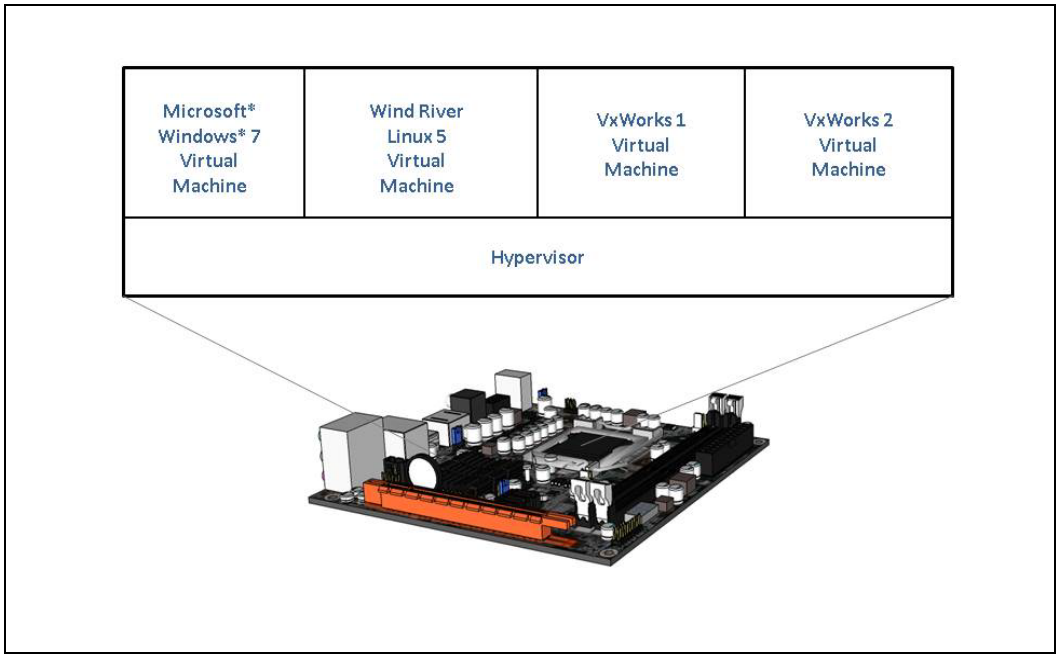
This edition of the SCS product also runs an instance of Microsoft* Windows* 7 Pro (64-bit) as a virtual machine that boots from the target platform (hardware) hard drive.

- It is the sole responsibility of the customer to purchase the Windows OS software and the appropriate licensing for the product.
- Windows shall be installed by the customer before using the system. See Section 6.9 - Intel SCS Windows* 7 (64-bit) Installation Instructions.

When you develop customized OS configurations to be run on the target platform, you may optionally boot the target platform from a USB that contains a bootable image carrying your customizations. Optionally, copy this same image to the target platform's hard drive via network or a serial connection to boot directly from the target platform hard drive.

Figure 4 – Target Platform OS Configuration and Figure 5 – Target Platform I/O Configuration depict high-level views of the system.

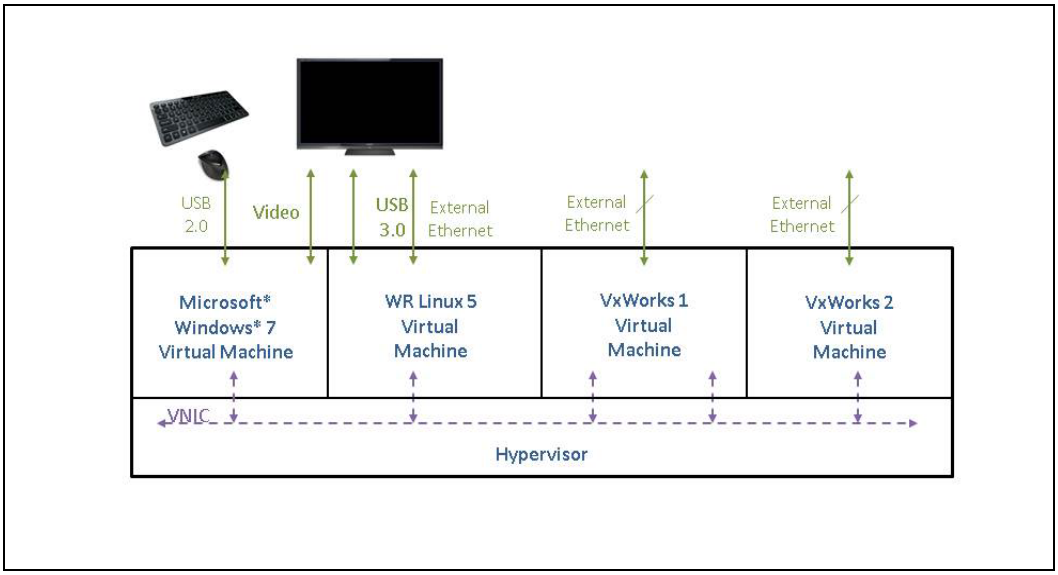
Figure 4 – Target Platform OS Configuration



6.4.1 Virtual NIC (VNIC)

The Intel® Industrial Solutions System Consolidation Series' (SCS) four virtual machines are networked together via a virtual layer 2 switch. Each individual virtual platform has a *virtual network interface card* (VNIC). This provides a virtual network infrastructure for the guest OSes to communicate with each other without using a physical network interface. See Figure 5 – Target Platform I/O Configuration.

Figure 5 – Target Platform I/O Configuration



NOTE: Dashed lines indicate virtual connections/devices.

The system cannot connect to the VNIC via an external interface directly. This means that when data is sent to the VNIC, it will always be transmitted to another guest OS.

A VNIC appears to the guest OS as a standard Ethernet interface. However, unlike a real NIC, the data never leaves the target platform. The act of transmitting data from one VNIC to another is simply a memory copy of the Ethernet frame from one guest OS to another.

6.4.2 Default Target OS IP Address Assignment

Intel® Industrial Solutions System Consolidation Series (SCS) assigns target platform IP addresses to the four guest operating systems by default as follows:

- **Windows* 7** – 10.0.0.2
- **Linux 5 –** 10.0.0.3
- **VxWorks 1 –** 10.0.0.4
- **VxWorks 2 –** 10.0.0.5

6.4.3 Customizable Target OS IP Address Assignment

While you can modify a guest OS address manually from a guest OS's command shell, this change is not persistent. A target platform reboot restores the default IP addresses (10.0.0.2 through 10.0.0.5.)

6.4.4 Subsystem Connectivity

The single Linux VM and the two VxWorks VMs are configured to use the serial port to interface with the development host. Because there is a single physical serial port used for debugging, access is shared among the OSes. The asynchronous multiplexed I/O (AMIO) component takes care of multiplexing the serial streams. Wind River Workbench's AMIO terminals are designed to demultiplex the serial stream so that every platform's serial stream appears individually in its own Workbench console.

The system assigns the target platform devices (such as serial port, NIC, disk controllers, USB controllers, and PCI cards) dynamically during the boot-up procedure.

6.4.5 Accessing Microsoft Windows Operating System

The Windows VM directly supports keyboard, mouse, and monitor and can be used right on the target platform.

6.4.6 Accessing Linux and VxWorks Operating Systems

The VxWorks VMs do not directly support human interface devices such as a monitor, keyboard, and mouse. These targets are accessed via a remote connection from the development host through the AMIO console. The Linux VM on the target platform can be accessed from the development host by using a serial command line connection in the AMIO console as described in Section 6.4.4 above.

6.5 Development Host Subsystem Overview

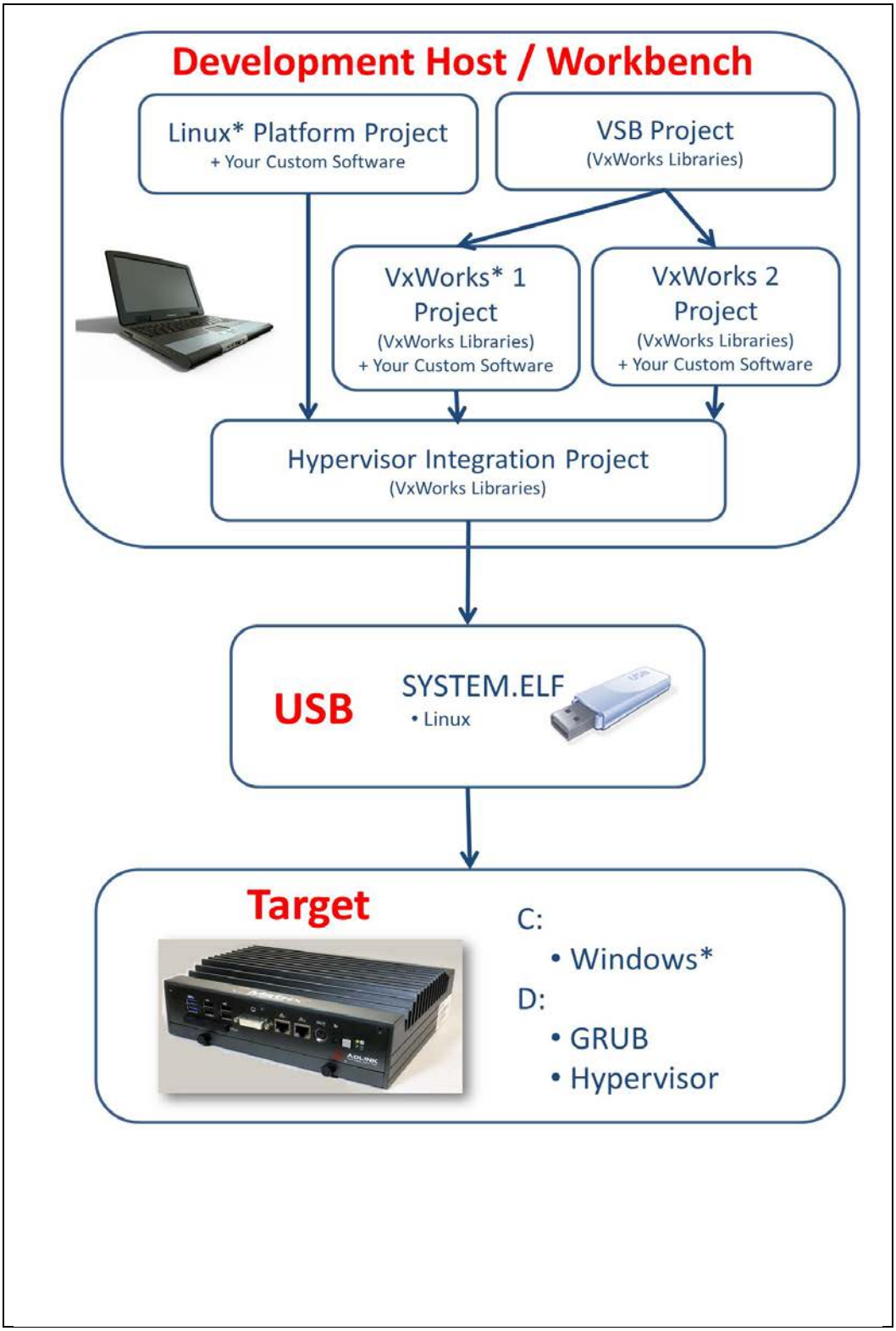
The SCS development host operates as a system separate from the target platform. The development host uses Wind River Systems Workbench software as its development tool. Within Workbench, you use special development units called *projects* to develop, organize, and compile customized productivity applications and other software.

After you finish development on the development host, you either:

- (Option A) load your developed software directly onto the target platform through a live connection (usually via serial cable or Ethernet), or
- (Option B) use development host *projects* to compile your software into Linux and VxWorks, which are then combined with other Workbench project information to create a bootable image file called **system.elf**. You then copy this image to USB media to boot the target.

Figure 6 - Target Boot Image Project Compilation shows how the various development projects combine to create the bootable USB media image as described in Option B.

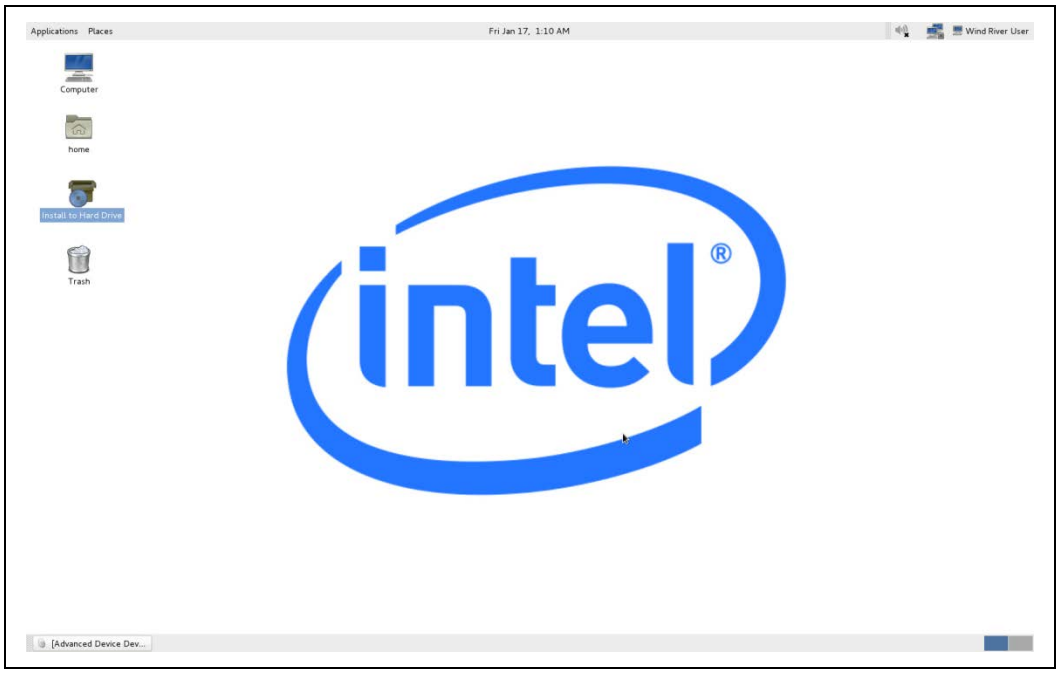
Figure 6 - Target Boot Image Project Compilation



6.5.1 Development Host Linux Shell

The development host Workbench software uses Linux as the resident platform for its development software. See Figure 7 - Development Host Desktop. When you start up the Workbench development host software, it loads on top of the development host Linux shell.

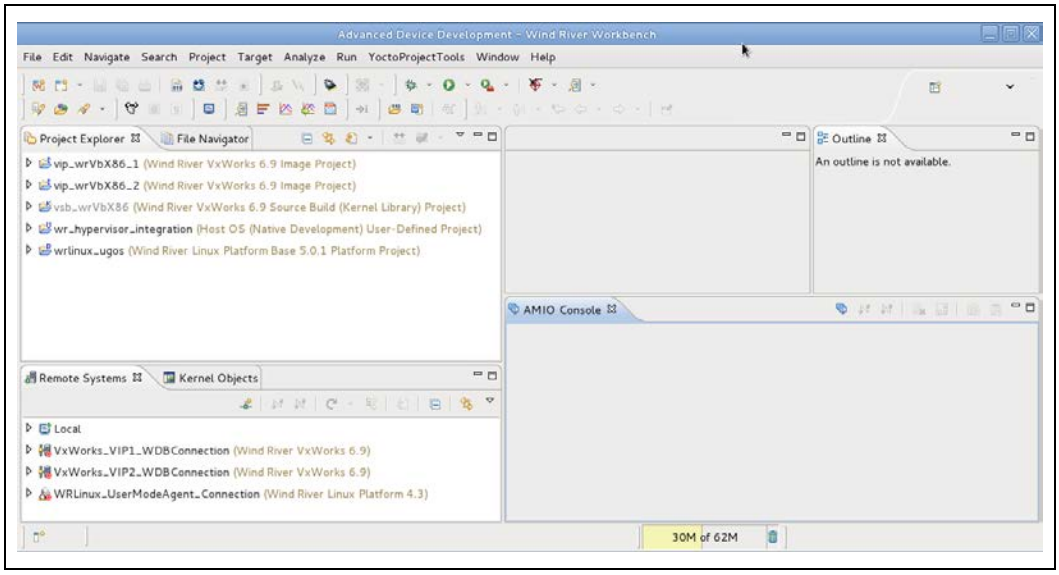
Figure 7 - Development Host Desktop



6.5.2 Wind River Workbench

The Intel® Industrial Solutions System Consolidation Series (SCS) development host uses *Wind River Workbench* as its primary development software. See Figure 8 - Workbench Workspace.

Figure 8 - Workbench Workspace



Workbench is an Eclipse-based development suite that provides an efficient way to develop real-time and embedded applications with minimal intrusion on the target system. It is an integrated development environment for creating software that runs on embedded Wind River Linux or VxWorks systems. Workbench includes a full project management facility in addition to a suite of tools for source code development, debug, and analysis. It provides the capability to manage multiple processes and threads on Linux and VxWorks systems.

For more information about Workbench, refer to the Wind River documentation. Find other Wind River documents in Workbench under **Help > Help Contents > Wind River Documentation**.

6.5.3 Special Version of Workbench

Intel® Industrial Solutions System Consolidation Series (SCS) comes with a special implementation of Wind River Workbench that runs on development host hardware that you provide. This version of Workbench is optimized for development of applications that you load onto and run on the target hardware.

After installing the SCS development software and licenses (see Section 6.6 – License the System and Section 6.7 - Install the Development Host Software) to your development host hard drive, you are ready to begin development using Wind River Workbench.

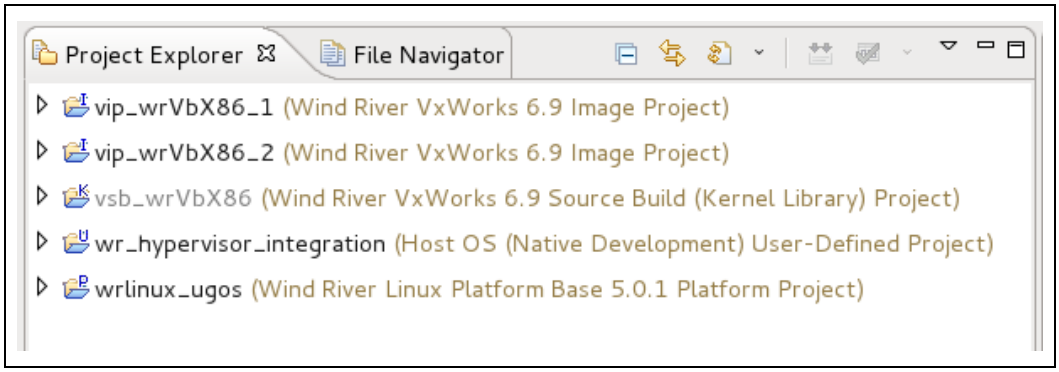
NOTE: For help using the special version of Workbench on SCS, read this *User Guide* in its entirety and access other help files on the User Support media.

6.5.4 Workbench Projects

The Workbench development environment uses *projects* as the building blocks for activities such as the development of applications for the target OSes.

Figure 9 - Project Explorer shows several preconfigured projects as they appear in Workbench's top workspace console, the *Project Explorer*.

Figure 9 - Project Explorer



The SCS version of Workbench has *preconfigured projects*. These projects are prebuilt packages that help reduce time you spend in development effort.

The development host system comes pre-loaded with five preconfigured projects:

- **vip_wrVbX86_1** – This is the VxWorks image project (VIP) that provides the build information for the first VxWorks virtual machine that appears on the target platform. This project is configurable, for example, to include source code for applications you have created to run on VxWorks.
- **vip_wrVbX86_2** – This is the VxWorks image project (VIP) that provides the build information for the second VxWorks virtual machine that appears on the target platform. This project is configurable, for example, to include source code for applications you have created to run on VxWorks.
- **vsb_wrVbX86** – This is a VxWorks source build library that provides the building blocks for the VIPs mentioned above.

  NOTE: The **vsb_wrVbX86** project is not configurable, and thus requires no user modification or interaction.
- **wr_hypervisor_integration** – This is a hypervisor integration project that combines the Linux and the two VxWorks images and creates the single hypervisor target image. This image is used to boot the target. This type of

project has limited configurability. If you create your own Linux or VxWorks project, you can edit the makefile to use your project instead of the default one. You can also update the script files used to allocate hardware elements to the various VMs.

NOTE: The **wr_hypervisor_integration** project is not configurable, and thus requires no user modification or interaction.

- **wrlinux_ugos** – This is a Wind River Linux platform project that provides the build information for the Linux virtual machine that appears on the target platform.

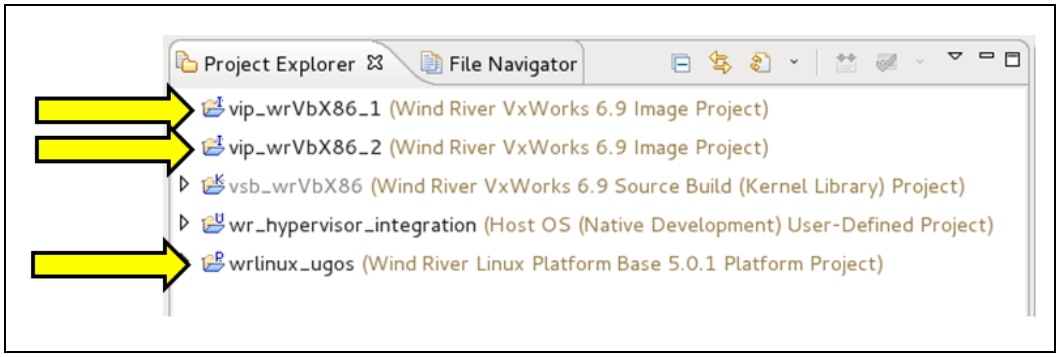
6.5.5 The Target Image

If you have your own application code, you can create a Linux application project, a VxWorks downloadable kernel module (DKM) project, or a VxWorks real-time process (RTP) project to compile your code. Those projects can then be integrated in the Linux or VxWorks images.

NOTE: For more information about using DKMs in Workbench, see *Wind River Workbench User Guide Section 3.5*.

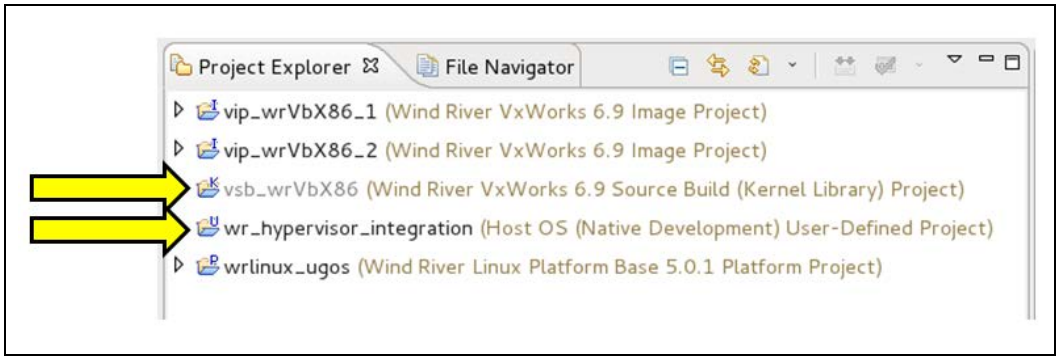
Using Workbench, you can also create your own Linux or VxWorks images instead of using the modifiable default projects shown by the arrows in Figure 10 – Modifiable Projects.

Figure 10 – Modifiable Projects



However, when creating a new target system, the SCS system will use two unmodifiable projects (**vsb_wrVbX86** and **wr_hypervisor_integration**) shown by the arrows in Figure 11 – Unmodifiable Projects.

Figure 11 – Unmodifiable Projects



Collectively, all Workbench projects created on the development host contribute to creating a bootable target image file specifically optimized to run on the SCS target.

After creating the target image file on the development host, you place this image file onto a bootable USB flash drive, insert the flash drive into the target platform, and then use the flash drive to boot the hypervisor and launch the guest OSes on the target platform.

Figure 6 - Target Boot Image Project Compilation shows that the VxWorks Source Build project combines with the two VxWorks Image Projects along with the Linux Platform Project. All of these projects funnel into the Hypervisor integration project (HIP). The HIP uses all project information to create the **system.elf** file, which you use to boot the VMs on the target hardware.

The hypervisor is preconfigured to boot four virtual machines: one instance of Windows, one instance of Linux, and two instances of VxWorks. While you cannot modify this configuration, you can control which hardware devices (Ethernet ports, serial ports, disk controllers, USB, and so on) are assigned to specific virtual machines that you configure using scripts you modify in Workbench.

6.5.6 Development Host Hardware

The development host platform is hardware that you provide. For development host specifications, see Section 4.1.2 - Development Host Specifications.

6.5.7 Development Host Installation Software

Intel® Industrial Solutions System Consolidation Series development host installation software resides on the *Development Host* media USB. Because the software has comes to you in an unlicensed state, follow the licensing procedure to activate the *Development Host* installation media. After activation, you may install the development host software onto your development host. See Section 6.6 – License the System.

6.6 License the System

Intel® Industrial Solutions System Consolidation Series is comprised of two subsystems:

- Target platform
- Development host

Read further for important licensing information pertaining to both subsystems.

6.6.1 Target Platform Software Licensing

The *target platform* is hardware shipped in the product packaging. While this requires no license acquisition on your part, please read, understand, and comply with the licensing materials that come with the product packaging.

In addition, this edition of SCS runs an instance of Microsoft* Windows* 7 Pro (64-bit) as a virtual machine that boots from the target platform (hardware) hard drive. It is the sole responsibility of the customer to purchase the Windows* OS software and the appropriate licensing for the product.

Windows* shall be installed by the customer before using the system. For installation instructions, see Section 6.9 Intel SCS Windows* 7 (64-bit) Installation Instructions.

6.6.2 Development Host Software Licensing

The *development host* is hardware that you provide. Later you will install the software from the *Development Host* USB media onto the development host. Before you are able to install this software onto your development host PC, you must first request a license key file to activate your *Development Host* media.

IMPORTANT: Make certain your development host PC meets or exceeds the specifications shown in Section 4.1.2 - Development Host Specifications.

Follow this procedure to request a license key file.

6.6.2.1 Determine the Host-ID / Host Name

In this section, you determine your development host PC's Host-ID and Host Name.

CAUTION: After you determine your development host Host-ID and Host Name, you later install the development host software onto the development host PC you provide. When installing the development host software, the system destroys all data (including any applications and OSes) already installed on your development host PC hard drive. Make certain to back up all data to external storage media before installing the development host software. Failure to do so may result in loss of data on the development host.

Before you can license and activate your development host software, you must first provide some information specific to your development host PC. Part of the information you provide is your development host PC's:

- **Host Name –** A system name assigned to the development host PC.

- **Host-ID –** An 8- or 12-character hexadecimal number.

If your development host PC does not have a pre-existing OS…

If your development host PC does not have a pre-existing OS:

Insert the *Development Host* USB media into your development host and boot PC from that media.

After the system boots, a Linux development desktop appears. Follow the instructions in Section 6.6.2.1.3 - For Linux OS: to determine the development host Host-ID and Host Name.

If your development host PC does have a pre-existing OS…

Many times a development host is already running one of the operating systems mentioned in the following sections. Skim the sections that follow for instructions specific to your OS.

6.6.2.1.1 For Windows OS:

Use this instruction if your development host PC has a Windows OS.

If your development host machine has a single Ethernet port, use the 12-character MAC address.

Go to **Start > Run**. A **Run** window appears.

Type **cmd** and press **Enter**. A command console appears.

Type **ipconfig –all** and press **Enter**.

The result should be similar to the following:

```
Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix . :
Description . . . . . . . . . . . : 3Com 3C920 Fast Ethernet
Physical Address. . . . . . . . . : 00-06-5A-21-95-44
```

In this example, the Host-ID is 00065A219544 (after removing the dashes from the physical address)

Record the Host-ID.

At the command prompt, type **hostname** and press **Enter**. A Host Name value appears.

Record the Host Name and proceed to Section 6.6.2.2 - Locate the Serial Number

6.6.2.1.2 For Windows OS (Alternate Procedure):

Use this instruction if your development host PC has a Windows OS and if the previous Windows instructions did not work.

If your development host machine has multiple Ethernet cards, is a laptop that is connected with a docking station with its own Ethernet card, or does not have a NIC card, use the hard drive serial number pre-pended with “DISK_SERIAL_NUM=”.

Go to **Start > Run**. A **Run** window appears.

Type **cmd** and press **Enter**. A command console appears.

Type **vol** and press **Enter**.

The result should be similar to the following:

```
Volume in drive C has no label.
Volume Serial Number is C0FC-0C4E
```

In this example, the Host-ID is **DISK_SERIAL_NUM=C0FC0C4E**. Make certain to pre-pend the value with **DISK_SERIAL_NUM=** with any dashes and colons removed.

Record the Host-ID.

At the command prompt, type **hostname** and press **Enter**. A Host Name value appears.

Record the Host Name and proceed to Section 6.6.2.2 - Locate the Serial Number

6.6.2.1.3 For Linux OS:

Use this instruction if your development host PC has a Linux OS.

Determine the 12-character Ethernet address in Linux.

Run the first line shown below and see the result similar to that shown in the second line.

```
% /sbin/ifconfig -a | grep -i hwaddr
eth0... Hwaddr 00:06:5B:82:F4:5A
```

In this example, the Host-ID is 00065B82F45A (after removing the colons from the value following **Hwaddr**).

Record the Host-ID and proceed to Section 6.6.2.2 - Locate the Serial Number.

NOTES:

- Do not use **hostid**. The Linux **hostid** command produces a 6- or 8-character result that is not valid as a Host-ID.
- Make certain your Ethernet (eth) device lists as **eth0**. If your PC lists its first Ethernet device as **eth1** or **eth2** (and so on), the **Hwaddr** value will not work in conjunction with a development host license key, and your development host license will fail to function. If the first Ethernet (eth) does not list as **eth0**, then rename it as **eth0**, and redo the **ifconfig** command shown above.

6.6.2.1.4 For Solaris OS:

Use this instruction if your development host PC has a Solaris OS.

At the command prompt, run:

```
% hostid
% 83299eed
```

The 8-character value shown above is the PC's Host-Id.

Record the Host-ID that appears on your display.

At the command prompt, type **hostname** and press **Enter**. A Host Name value appears.

Record the Host Name and proceed to Section 6.6.2.2 - Locate the Serial Number

6.6.2.2 Locate the Serial Number

The 12-digit serial number is located on the top left corner of the *Startup Guide* shipped with this product. Find and record this number for use in the next step.

6.6.2.3 Go To License Website

Go to the following website:

```
registrationcenter.intel.com
```

Enter your email address and the serial number that was included on the *Startup Guide*. If you have not registered with your email address at the Intel Registration Center, you will be asked to create a new login ID and password.

After entering the email address and serial number (and registering as a new user if needed), a new web page will appear.

Enter the following information into the matching fields on the web page:

1. First Name:
2. Family Name:
3. Company Name:
4. Your Job Title:
5. Address:
6. Country:
7. Phone:
8. Email Address:
9. Your Company's Industry:
10. Host-ID:
11. Host Name:

Click the **Submit** button.

NOTE: Repeat the procedure for each additional license that you need to request for additional separate development host PCs.

IMPORTANT: The license issued will only activate the development host software for the PC hardware HOST ID you submitted. This license will not allow installation of the development host software onto a different PC.

Within approximately 24 business hours, you should receive a response email with a license file attachment from IOT SW Licensing (iot.sw.licensing@intel.com). If you do not receive a response for your license request, please:

- check your email spam folder for a response message, OR
- contact your Intel Corporation sales representative for assistance.

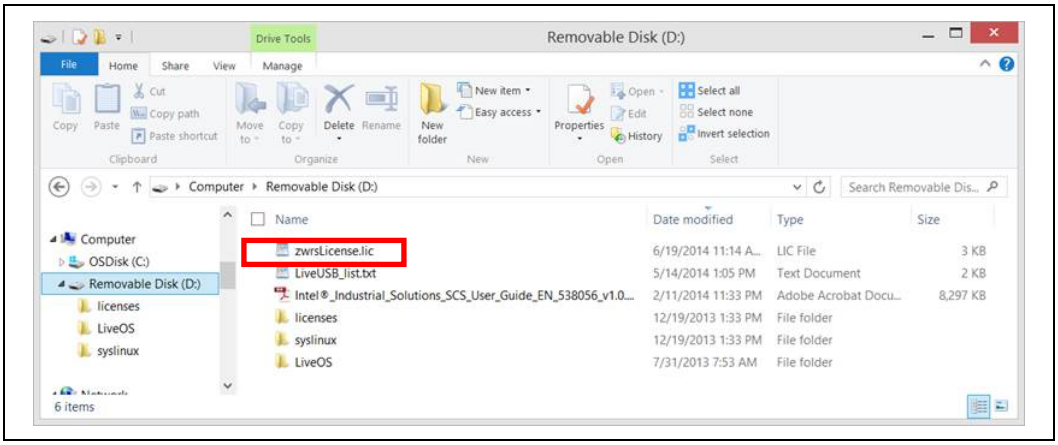
6.6.2.4 Install the License

After receiving the response email, follow the instructions below to install the license.

Insert the *Development Host USB* media into an available computer and copy the licensing attachment provided (wrhost.txt) in your licensing email to the root directory of the USB stick.

Rename the licensing file to **zwrsLicense.lic**. See Figure 12 – Rename the Licensing File. The example shown here is for a Microsoft* Windows* computer.

Figure 12 – Rename the Licensing File



Remove the USB stick.

Proceed to Section 6.7– Install the Development Host Software.

6.7 Install the Development Host Software

CAUTION: In this section you install the development host software onto the development host PC you provide. When installing the development host software, the system destroys all data (including any applications and OSes) already installed on your development host PC hard drive. Make certain to back up all important data to external storage media before installing the development host software. Failure to do so may result in loss of data on the development host.

After you license the development host flash media according the instructions above, follow this procedure to install the development software to your development host PC.

Power down the development host PC.

Insert the Development Host USB media into the user-provided development host PC.

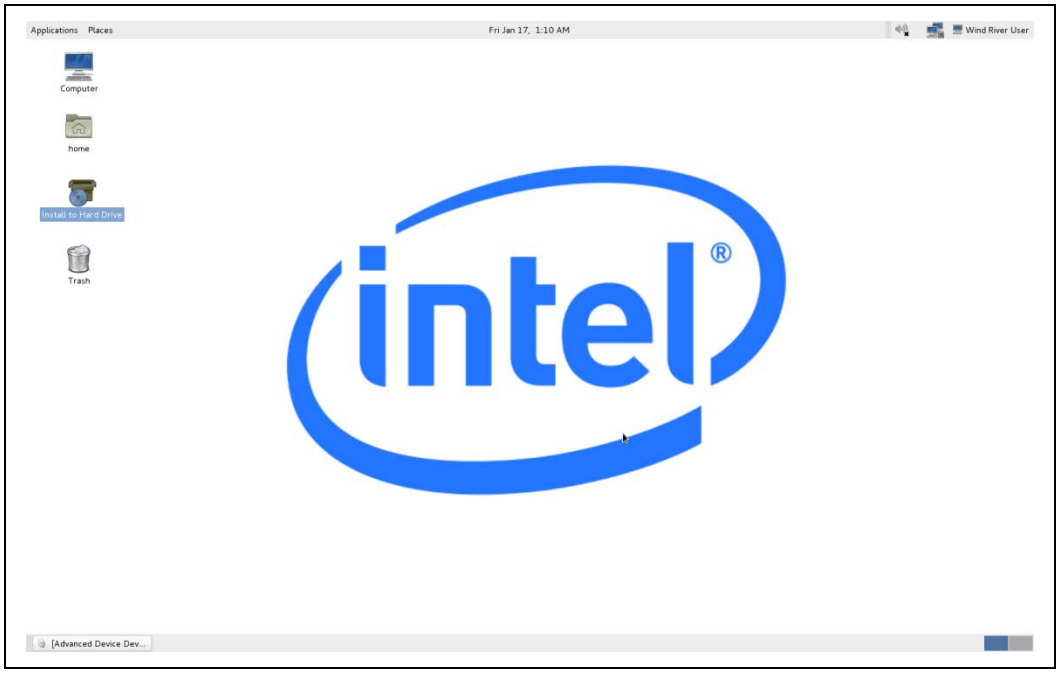
TIP: Intel Corporation recommends that you insert the media into a USB 3.0 port.

Power up the PC.

Several system screens appear and disappear as the system loads.

The license window disappears and the system loads to the Wind River Linux desktop. See Figure 13 – Linux Desktop.

Figure 13 – Linux Desktop



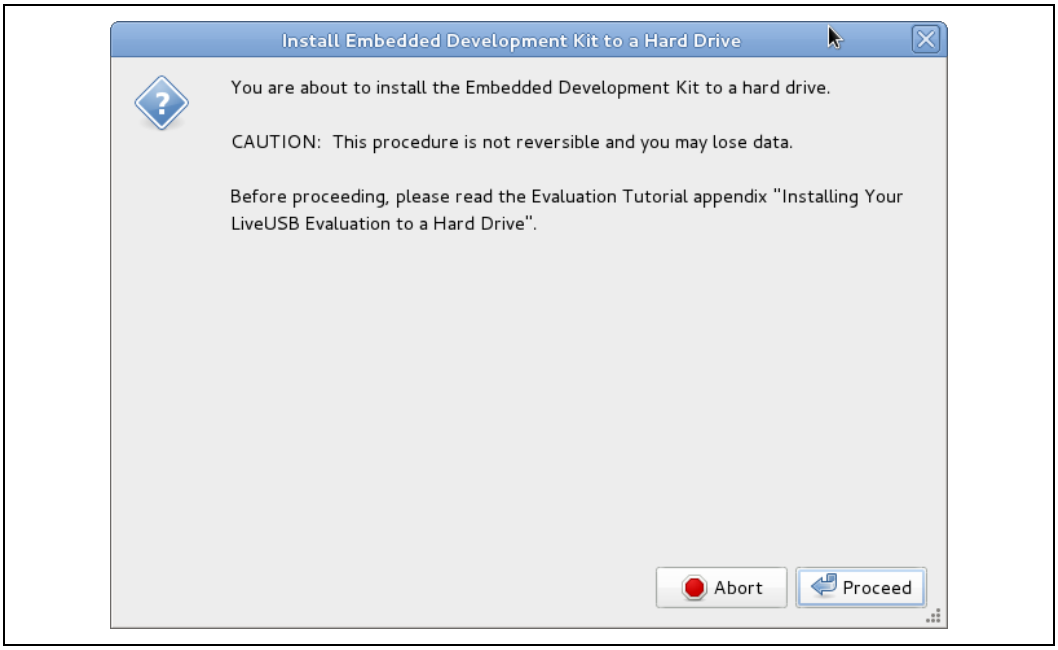
Double-click the **Install to Hard Drive** icon. See Figure 14 – Install Icon.

NOTE: After licensing the software and starting up the development host, the **Install to Hard Drive** icon may not appear immediately on the Wind River Linux desktop. If the **Install to Hard Drive** icon does not appear, wait several minutes to see whether the icon appears. If the icon still does not appear within five minutes, restart the system and restart this procedure.

Figure 14 – Install Icon

A warning window appears. See Figure 15 – Warning Window.

Figure 15 – Warning Window



Click **Proceed**. The cursor changes to a spinning disk for a few moments to indicate system progress. The cursor then returns to its default arrow appearance and remains this way for a few minutes.

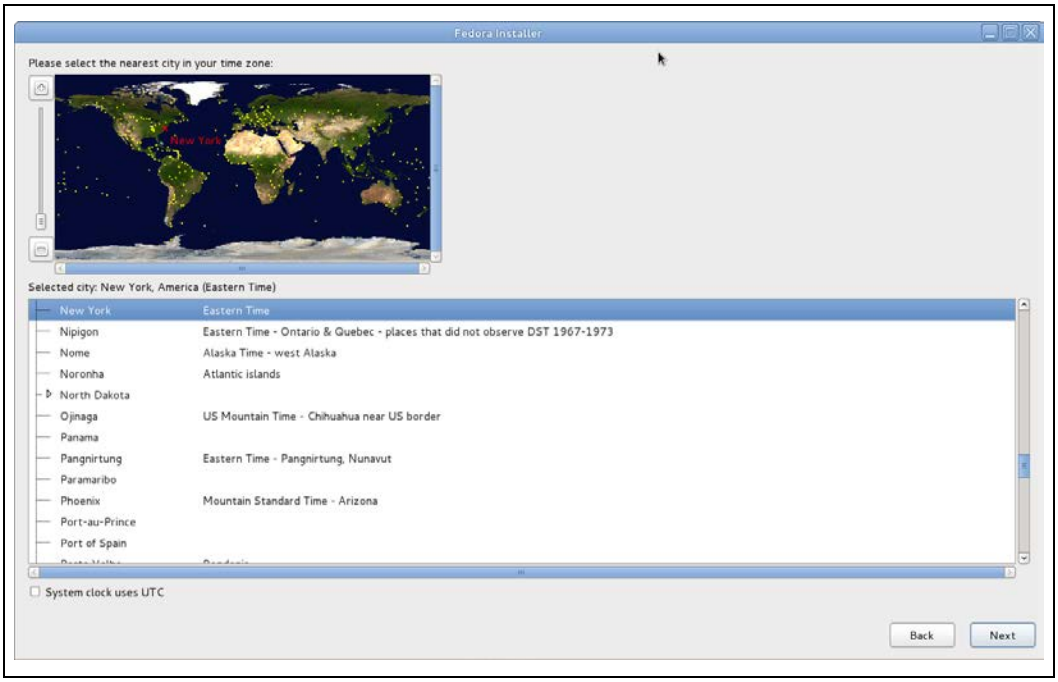
An **Examining Devices** window appears for a few moments. See Figure 16 – Examining Devices.

Figure 16 – Examining Devices

A Fedora* installer window appears prompting you to select an interactive language. (Window not shown here.)

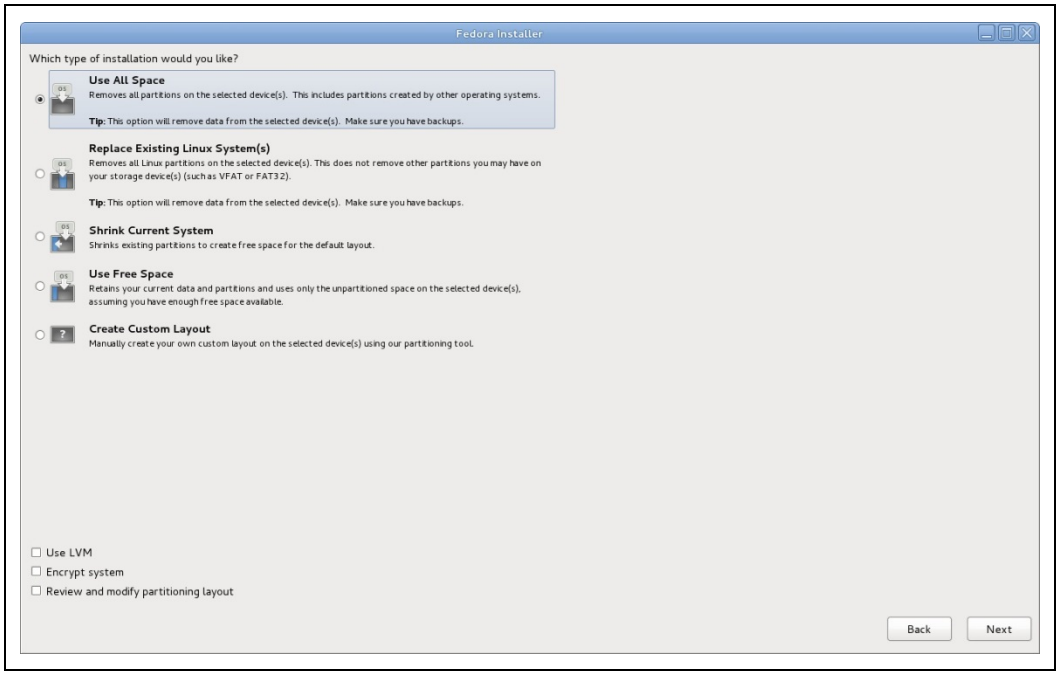
Select **US English** and click **Next**. The location window appears. See Figure 17 – Location Window.

Figure 17 – Location Window



Select your location and click **Next**. The following window appears. See Figure 18 – Installation Type.

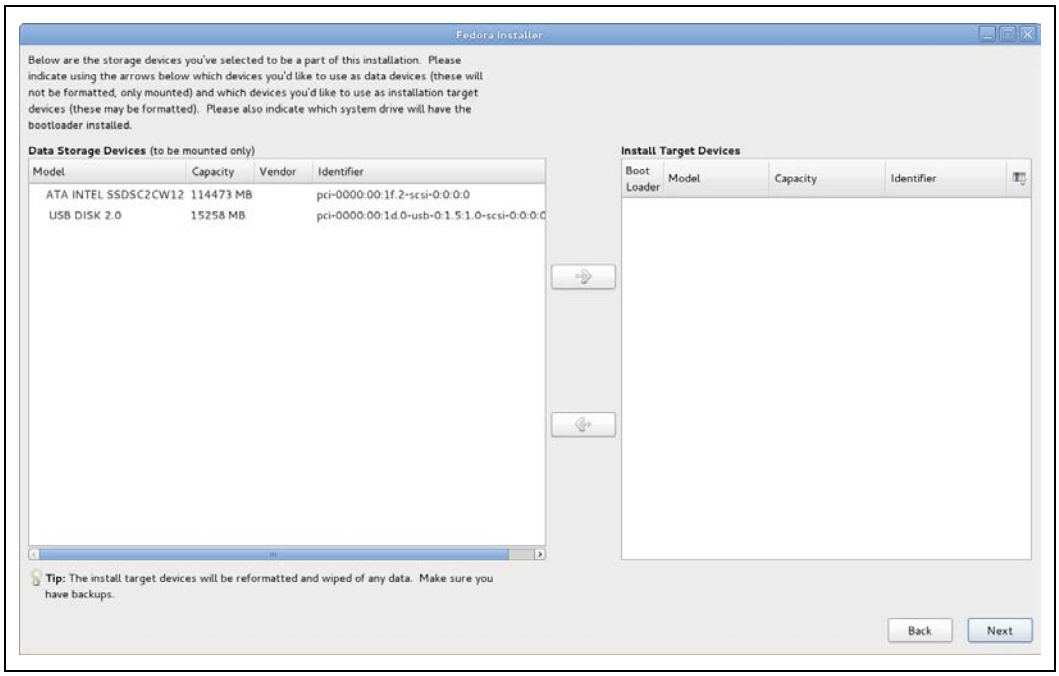
Figure 18 – Installation Type



Select **Use All Space.**

Make certain to uncheck **Use LVM** and click **Next**. The storage space window appears. See Figure 19 – Storage Space.

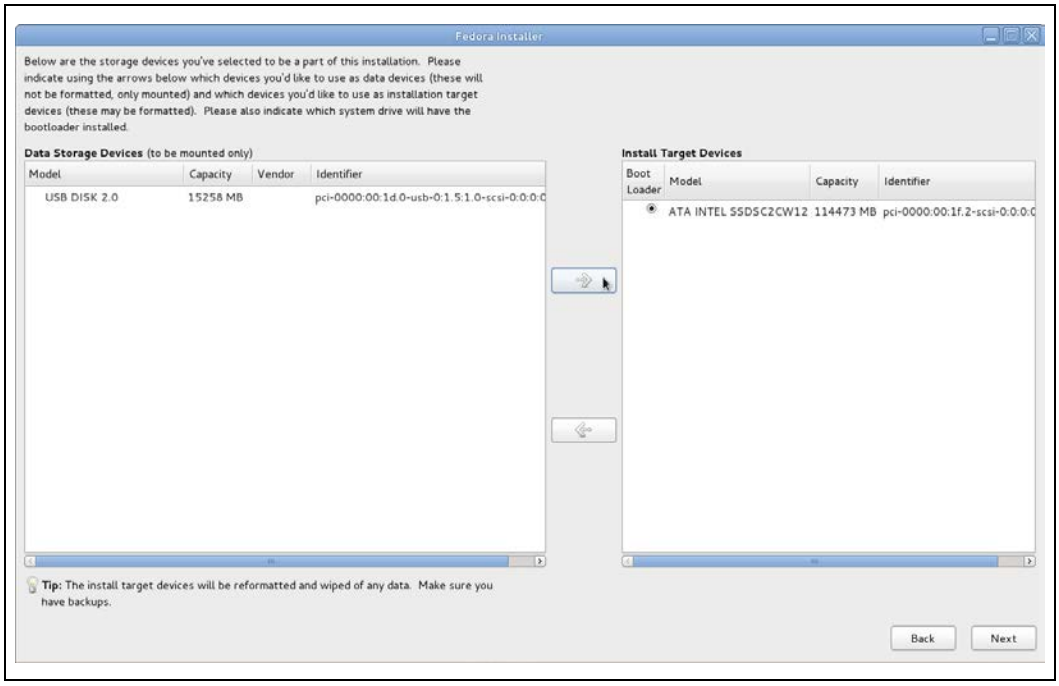
Figure 19 – Storage Space



In the **Data Storage Devices** pane (left) locate the local hard drive storage device onto which you wish to install the development host software. This adjacent figures use the **ATA Intel…** hard drive storage object as an example storage media.

Click the storage media object and then click the right (→) arrow to move the object into the **Install Target Devices** pane. See Figure 20 – Install Target Devices.

Figure 20 – Install Target Devices



Click **Next**. A small **Examining Devices** window appears and the software begins to install. See Figure 21 – Examining Devices.

Figure 21 – Examining Devices

Numerous other process windows appear and disappear as the system installs. See Figure 22 – System Installs.

Figure 22 – System Installs

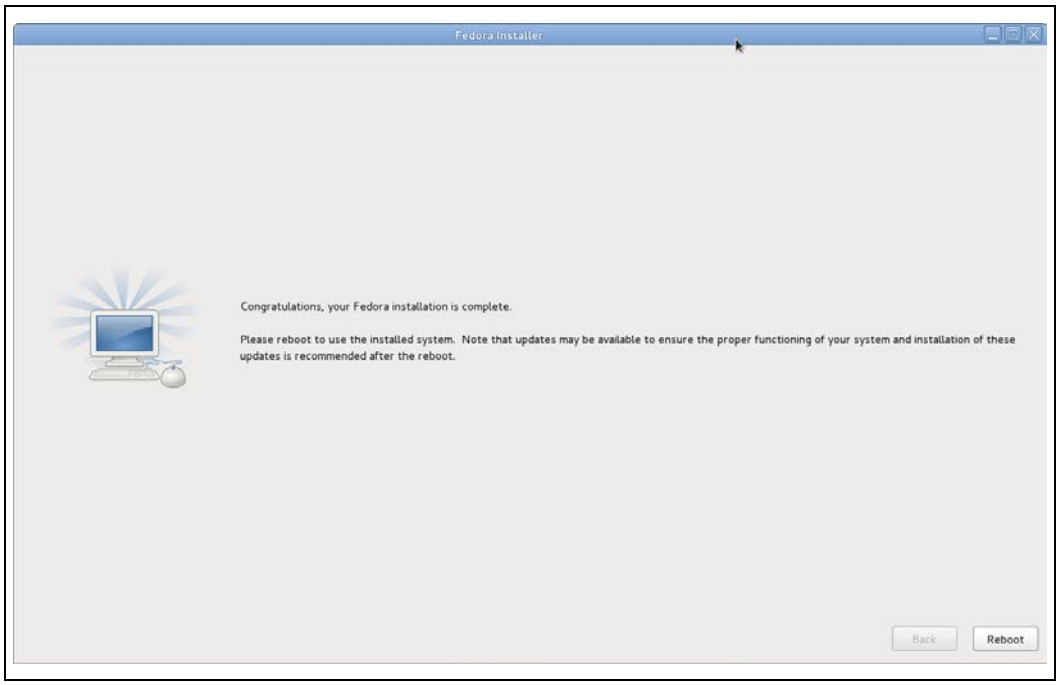
After a few minutes, the system prompts you, **Would you like to keep any changes you made to the LiveUSB environment?**

Select **No**.

NOTE: The system may take upwards of 45 minutes to install.

The system completes installing and a window appears prompting you to restart the system. See Figure 23 – Installation Complete.

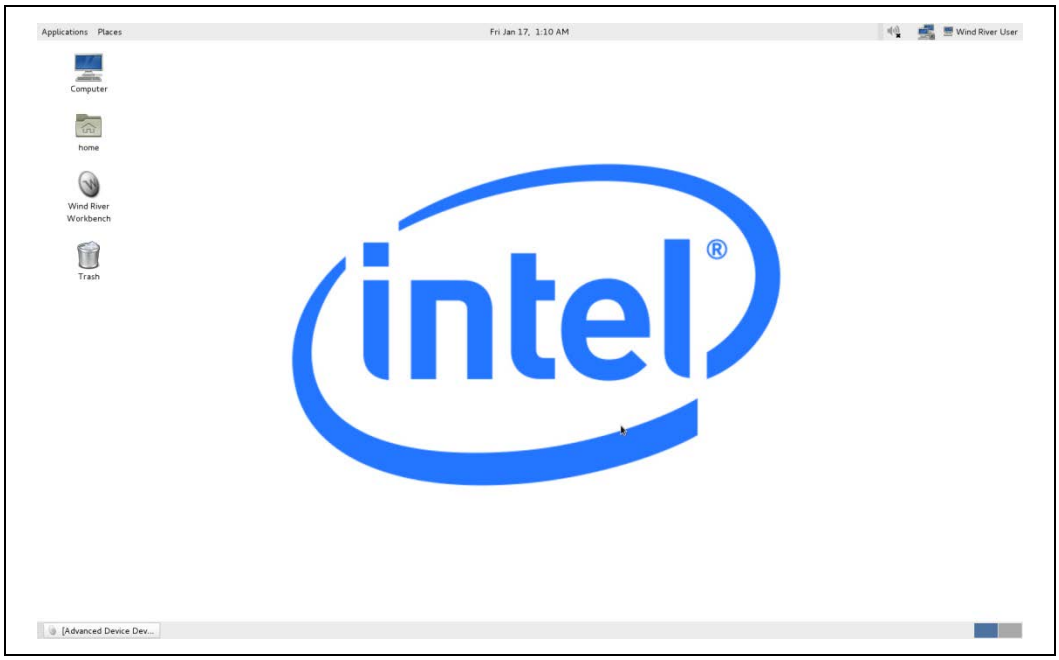
Figure 23 – Installation Complete



Click **Reboot**. After the system shuts down, remove the *Development Host* USB media before the system restarts.

Allow the system to restart. The Wind River Linux development host desktop environment appears. See Figure 24 – Linux Desktop.

Figure 24 – Linux Desktop



6.8 Set Up the Target Host

Follow the procedure to set up the target platform and development hosts.

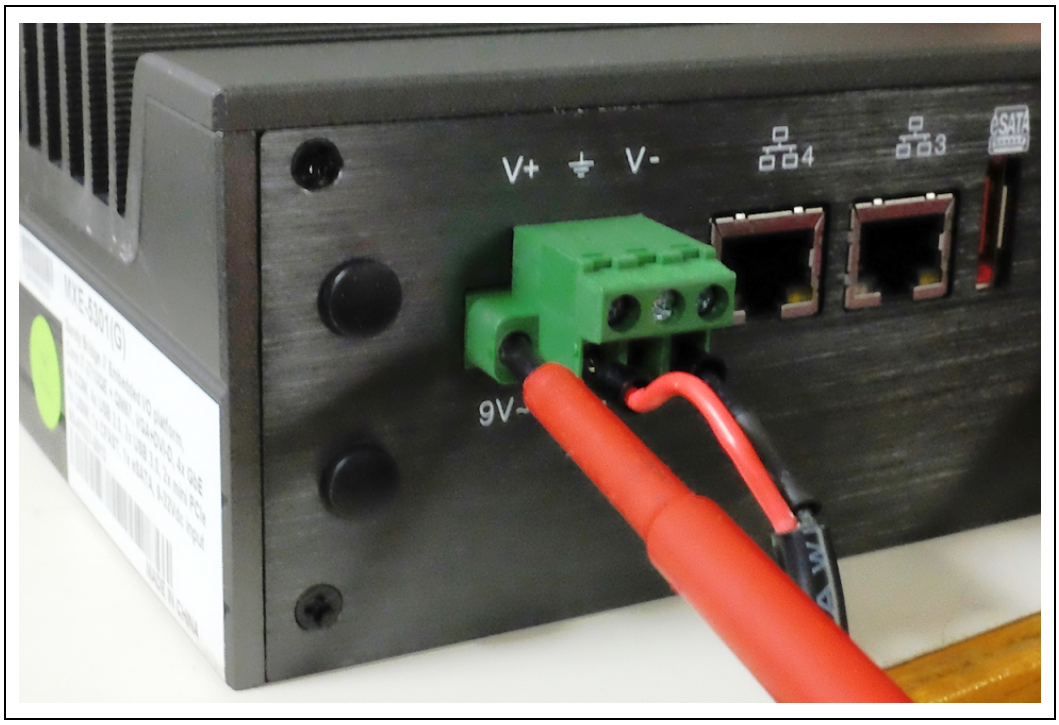
6.8.1 Set Up the Target Platform

Required tools:

- 1/8 inch (3 mm) flathead screwdriver

Use a 1/8 inch (3 mm) flathead screwdriver to attach the power inverter plug to the target power receptacle. See Figure 25 - Power Inverter Plug.

Figure 25 - Power Inverter Plug



Plug the power inverter power cord to a grounded power source receptacle.

IMPORTANT: Do not power up the target platform.

Connect the monitor to the target platform DVI-I video connector.

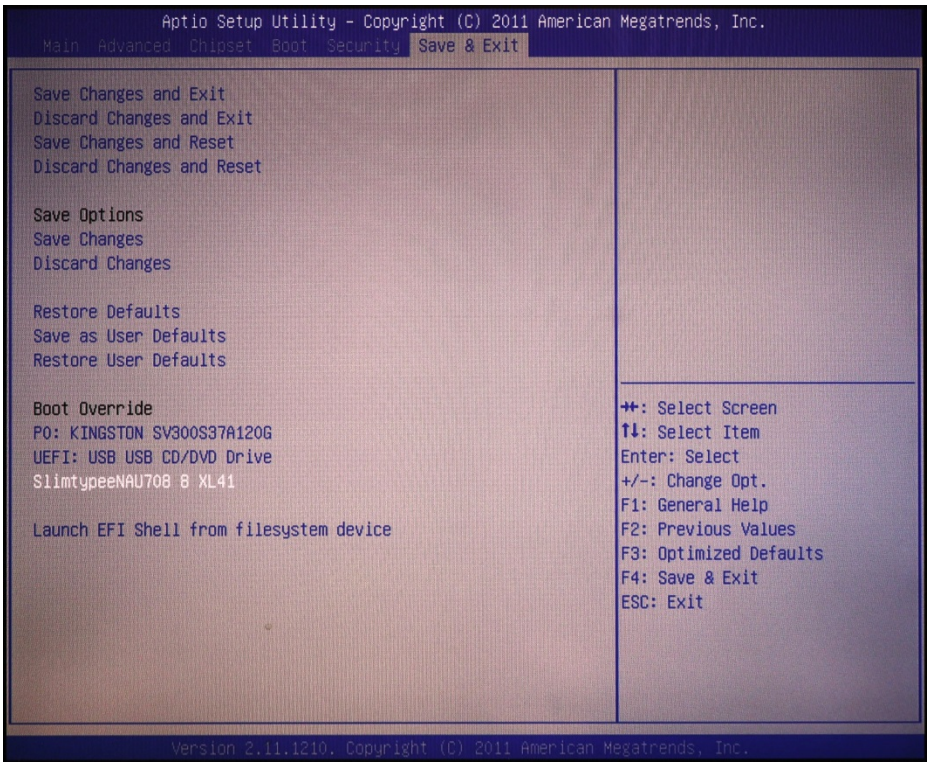
6.9 Intel SCS Windows* 7 (64-bit) Installation Instructions

Insert the Windows* 7 (64-bit) installation media into a USB 2.0 (black-colored) port.

Attach the keyboard and mouse to USB 2.0 (black-colored) ports.

Configure the SCS target platform BIOS to boot from the Windows installation media. See Figure 26 - BIOS.

Figure 26 - BIOS



NOTE: The hardware configuration may vary from that shown on the figure above.

Save the BIOS configuration and boot the target platform.

NOTE: While the target platform boots, you may be prompted by the message **Press any key to boot from CD or DVD**. If this message appears, press a key.

During start-up, a Windows Installation window appears, prompting you to choose the language settings. Choose your settings and click **Next**.

Another window appears. Click **Install Now**.

A screen appears stating **Setup is starting**.

A **Please read the license terms** window appears.

Check the **I accept the license terms** box. Click **Next**.

A new window appears labeled **Which type of installation do you want?**

Click **Custom (advanced)**

A new window appears labeled **Where do you want to install Windows?**

Select **Disk 0 Partition 2.**

Click **Drive options (advanced)**.

Click **Format**.

A new window appears warning that “the partition might contain recovery files”. Click **OK**.

Click **Next**.

A new window appears labeled **Installing Windows...** that shows the progress of the Windows installation. This portion of the Windows installation proceeds automatically. Eventually the system states **Setup will continue after systems restarts**.

The system restarts and a **Set Up Windows** window appears.

Enter the following values into the fields:

Type a user name **User**

Type a computer name **INDU-PC**

Click **Next.** A **Set a password for your account** window appears.

Enter the following values into the fields:

Type a password **indu**

Retype your password **indu**

Type a password hint **industrial**

Click **Next**. A **Type your Windows product key** window appears.

Uncheck the **Automatically activate Windows when I'm online** box.

Click **Next**.

A **Help protect your computer...** window appears.

Click **Ask me later**.

A **Review your time and date settings** window appears.

Select a time zone and click **Next**.

Select your computer’s current location and click **Next**. A new window appears stating **Windows is finalizing your settings**.

The Windows desktop appears. Basic Windows setup is complete. Proceed with the instructions that follow.

Disconnect the Windows installation media device.

6.10 Windows* 7 (64-bit) Post-installation Instructions

IMPORTANT: While operating Windows, do not update the system using Windows Update.

Insert the User Support USB media into a black USB 2.0 port.

Close the **AutoPlay** window.

Click the **Start** button.

In the command box, type **cmd**. A **cmd** icon appears in the **Programs** list.

Right-click the **cmd** icon and go to **Run as administrator** and select **Yes**. A command prompt box appears.

Type `E:` and press **Enter**.

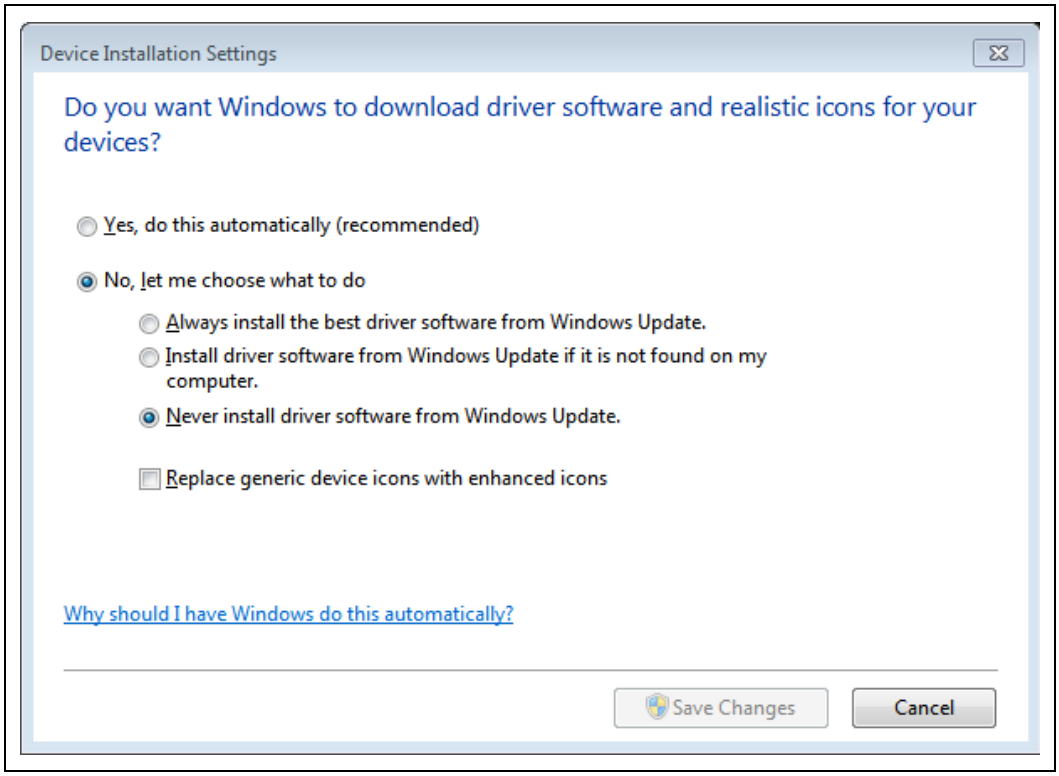
NOTE: Drive letters may vary. Use the drive letter representing the User Support media.

At the prompt, type `cd Configuration` and press **Enter.**

At the prompt, type `win7_post_installation.bat` and press **Enter**.

In the **Device Installation Settings** window that appears, confirm that your settings match those in the dialog below. See Figure 27 – Device Installation Settings.

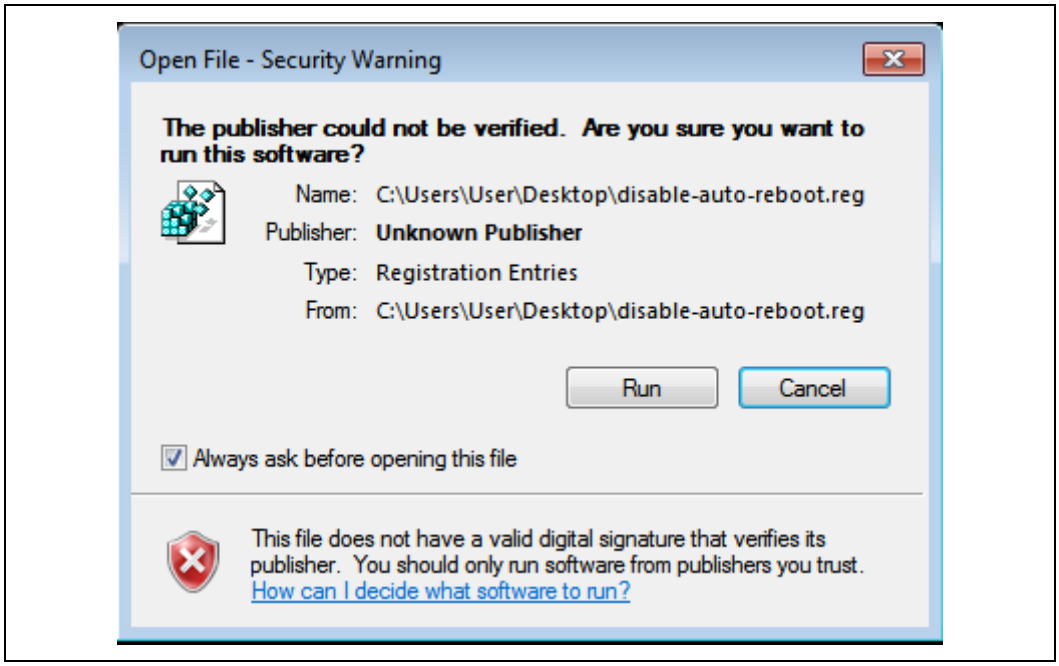
Figure 27 – Device Installation Settings



If your settings match those shown in the window above, press **Cancel.** Otherwise, configure them to match and press **Save Changes**.

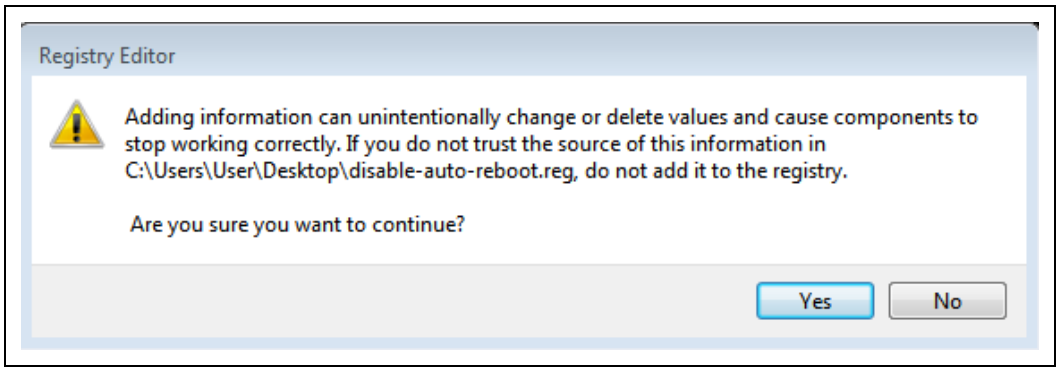
NOTE: If the *Open File – Security Warning* dialog appears, press **Run**. Otherwise, proceed to the next step.

Figure 28 – Open File – Security Warning



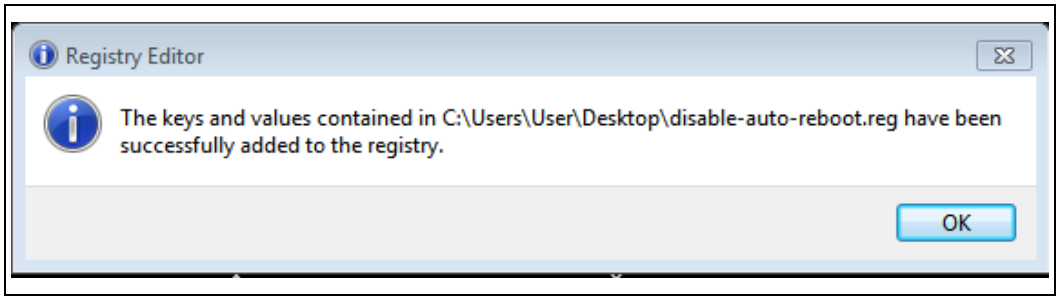
In the **Registry Editor** window, press **Yes**.

Figure 29 – Registry Editor



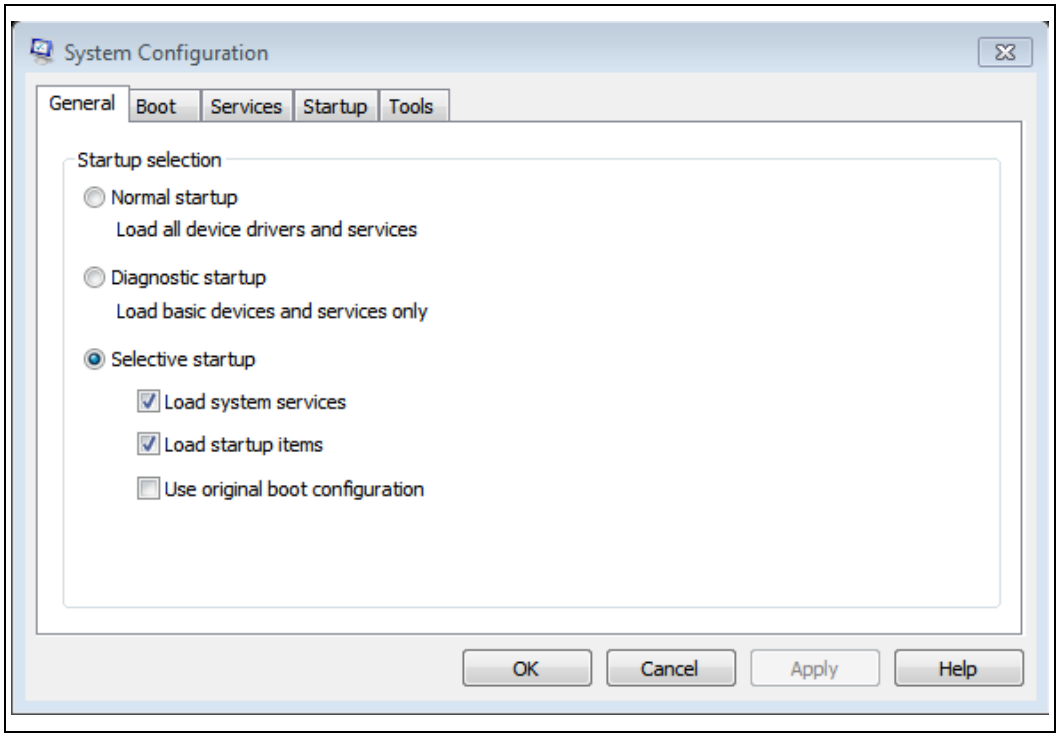
In the **Registry Editor** window, click **OK**.

Figure 30 – Registry Editor



In the **System Configuration** window **General** tab, confirm that the settings match those shown in Figure 31 – System Configuration.

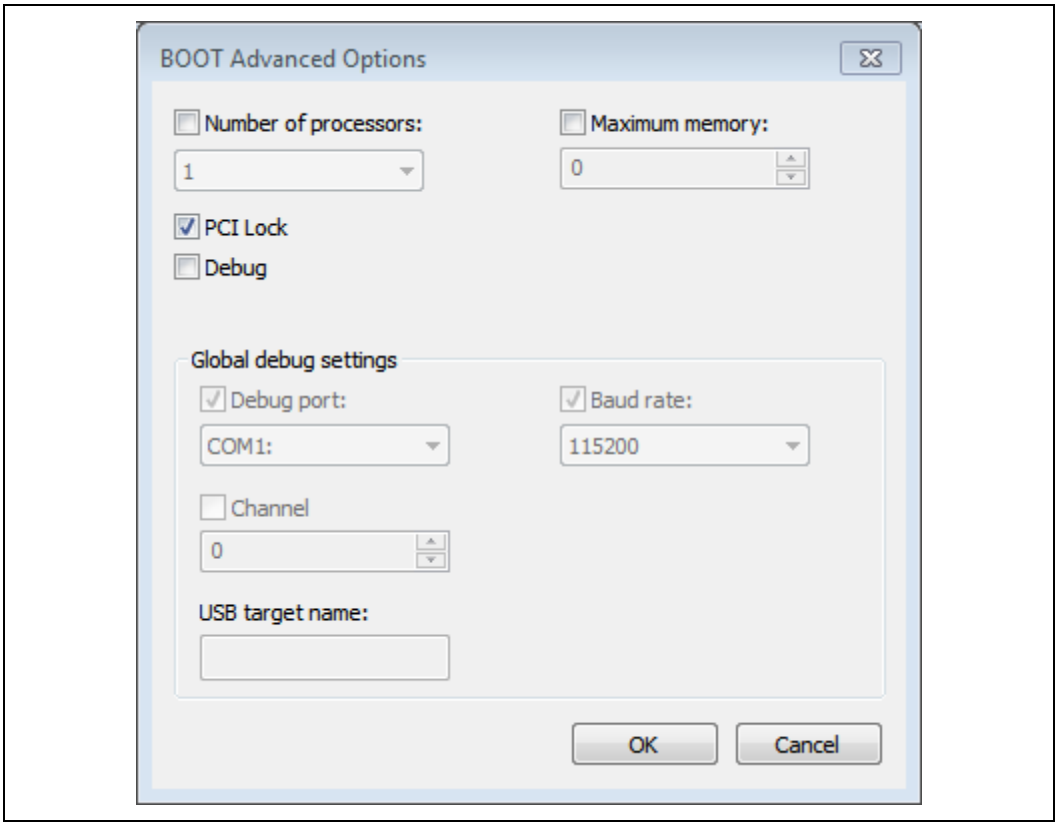
Figure 31 – System Configuration



In the **Boot** tab, click **Advanced options...** a new window appears.

Check **PCI lock** and click **OK**. See Figure 32- BOOT Advanced Options.

Figure 32- BOOT Advanced Options



Click **OK** again to close the **System Configuration** window.

Click **Exit without restart**.

Close the command window.

6.10.1 Install the Wind River Shared Memory Driver

Go to **Start and** right-click **Computer**. Select **Properties**.

Select **Device Manager**. A **Device Manager** window appears.

Select the **Computer** icon.

From the **Action** menu drop down, select **Add legacy hardware**. A window appears.

Click **Next**. A window appears.

Select **Install the hardware that I manually...** option.

Click **Next**. A window appears.

From the **Common hardware types:** scroll the list and select **Show All Devices**.

Click **Next**. A window appears.

Click **Have Disk...** A window appears.

Click **Browse...** A window appears.

Browse to User Support USB media. Go to **Configuration > WindRiver_Win7_64bit_Drivers > Shared_Memory**.

Select the **wrshmem** file icon.

Click **Open**. An **Install From Disk** window appears.

Click **OK**.

In the Add Hardware window, click **Next**.

Click **Next.** A **Windows Security** window appears.

Click **Install**. An installation progress window appears for a moment. A **Completing the Add Hardware Wizard** window appears.

Click **Finish**.

A **shared memory driver** icon appears in the **Hypervisor**.

6.10.2 Install the Wind River Virtual Network Interface Card (VNIC) Driver

Go to **Start > Computer**, right-click **Properties**.

Select **Device Manager**. A **Device Manager** window appears.

Select the **Computer** icon.

From the **Action** menu drop down, select **Add legacy hardware**. A window appears.

Click **Next**. A window appears.

Select **Install the hardware that I manually...** option.

Click **Next**. A window appears.

From the **Common hardware types:** scroll the list and select **Network adapters**.

Click **Next**. A window appears.

Click **Have Disk...** A window appears.

Click **Browse...** A window appears.

Browse to User Support USB media. Go to **Configuration > WindRiver_Win7_64bit_Drivers > VNIC**.

Select the **wrvnic** file icon.

Click **Open**. An **Install From Disk** window appears.

Click **OK**.

In the Add Hardware window, click **Next**.

Click **Next.** A **Windows Security** window appears.

Click **Install**. An installation progress window appears for a moment. A **Completing the Add Hardware Wizard** window appears.

Click **Finish**.

A **Wind River Virtual Ethernet Adapter** icon appears in the **Network adapters** list.

NOTE: The icon appears with an exclamation (!) symbol. This condition is normal and requires no correction.

Close **Device Manager**.

6.10.3 ADlink Windows 7 Driver Installation

Download and install each of the following *64-bit* drivers from the ADlink website for the SCS factory-default configuration.

ADlink Technology, Inc. (http://www.adlinktech.com/)

- MXE-5300 Win7 64bit Audio Driver
- MXE-5300 Win7 64bit Chipset Driver
- MXE-5300 Win7 64bit Intel-LAN Driver
- MXE-5300 Win7 64bit USB3.0 Driver

6.11 Intel SCS Boot Loader Installation Instructions

6.11.1 Booting the Target Platform Using the User Support USB Drive

Shut down the target platform. Insert the *User Support* USB media.

Boot the target platform into BIOS by pressing the **Delete** key repeatedly during startup.

Once in the BIOS, go to **Boot > Hard Drive BBS Priorities > Boot Option #1** > the USB Flash Drive.

Press **Enter**.

Press the **Esc** key.

Go to Save & Exit > **Save Changes and Exit.**

Press **Enter**. The system reboots.

6.11.2 User Support OS Login

At the Debian GNU Linux login screen, use the following logon credentials:

Login: root

Password: scsadmin

6.11.3 Boot Loader Installation

Type `cd scsadmin` and press **Enter**.

Type `./post_installation` and press **Enter**.

Type `init 0` and press **Enter**. The system shuts down.

Remove the *User Support* USB media before you restart the target platform.

SCS system configuration is complete.

6.12 Windows VNIC Configuration Installation Instructions

Go to **Start > Control Panel > Network and Sharing Center**. A window appears.

Click **Change adapter settings**. An adapter list appears.

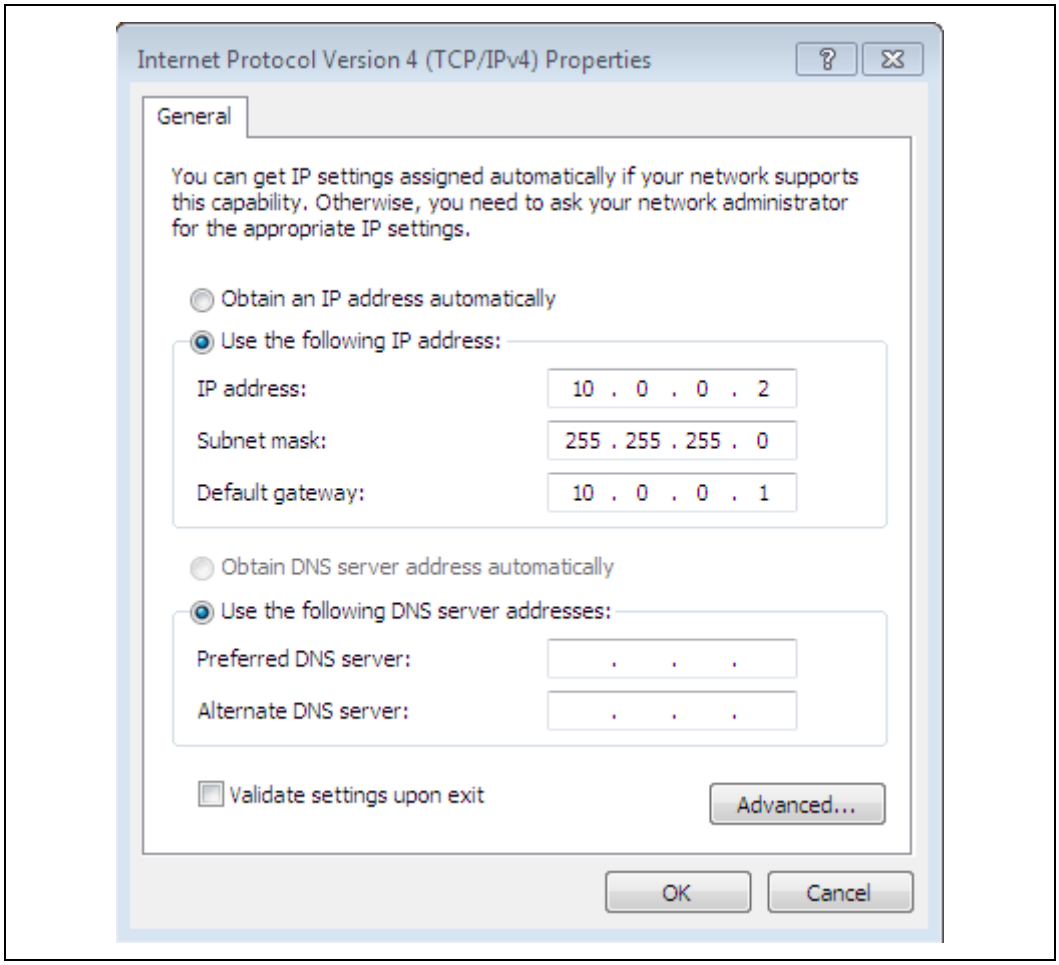
Right-click the **Wind River Virtual Ethernet Adapter** and select **Properties**. A window appears.

Select **Internet Protocol Version 4 (TCP/IPv4)**.

Click **Properties**. An IP properties window appears.

Enter the properties as shown in Figure 33 – Internet Protocol Version 4 (TCP/IPv4) Properties.

Figure 33 – Internet Protocol Version 4 (TCP/IPv4) Properties



Click **OK**. The window closes.

Click **Close**.

VNIC configuration is complete.

6.13 Configure Windows* 7 as a Time Server

Boot Windows 7 on the target platform.

Insert the *User Support* USB media into the target platform.

Create a scheduled task to run time sync at startup:

- Go to **Start > Computer**.
- Right-click the **Computer** icon and click **Manage**. A **User Account Control** window appears.
- Click **Yes**.

- Go to **System Tools > Task Scheduler.**
- On the right-hand pane, click **Import Task...** A window opens.
- Browse to and select file **C:\Intel\TimeSync\TimeSync.xml**
- Click **Open**.
- Click **OK**.
- Enter the password for User (the default is “indu”). Click **OK**.
- Close the **Computer Management** window.

Restart the platform to affect changes.

If at any point you believe the hard drive has been irretrievably corrupted or otherwise damaged, refer to Appendix B- - Target Platform Hard Drive Recovery Instructions for instructions on how to return the target platform hard drive to its original condition before Windows installation.

CAUTION: Appendix B- - Target Platform Hard Drive Recovery Instructions **contains instructions to restore the target platform hard drive to its original configuration before Windows installation. DO NOT perform this procedure as a part of preparation for first use of the system. Use the procedure if you believe the contents of the hard drive have been irretrievably corrupted or otherwise damaged.**

Performing the procedure will erase all data on the hard drive, including partitions and the Windows operating system.

6.14 Connect the Target Platform and Development Hosts

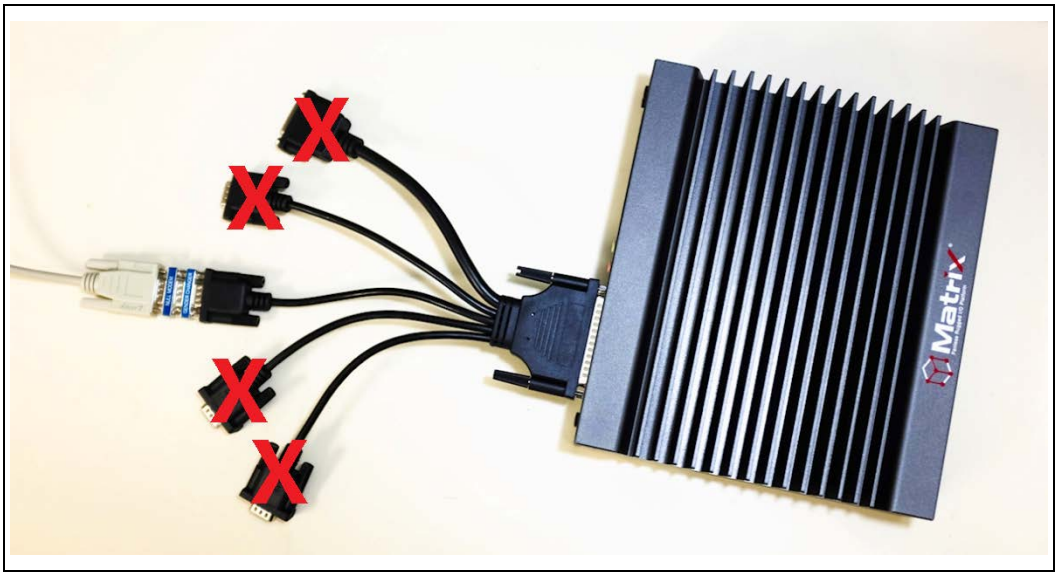
While there are several methods for the target platform and development host to communicate, the most common method is through a serial connection.

Follow the steps below to establish a serial connection.

Attach human interface devices to the development host. For a desktop PC, this includes the keyboard, mouse, and video/monitor cable. Connect the external video/monitor display to a grounded power source receptacle.

Connect the null modem serial cable between COM1 (labeled “1” on the target platform dongle) and the DB9 (RS-232) serial port on the development host. See Figure 34 - Target Platform Serial Connector and Figure 35 - Development Host Serial Connector.

Figure 34 - Target Platform Serial Connector

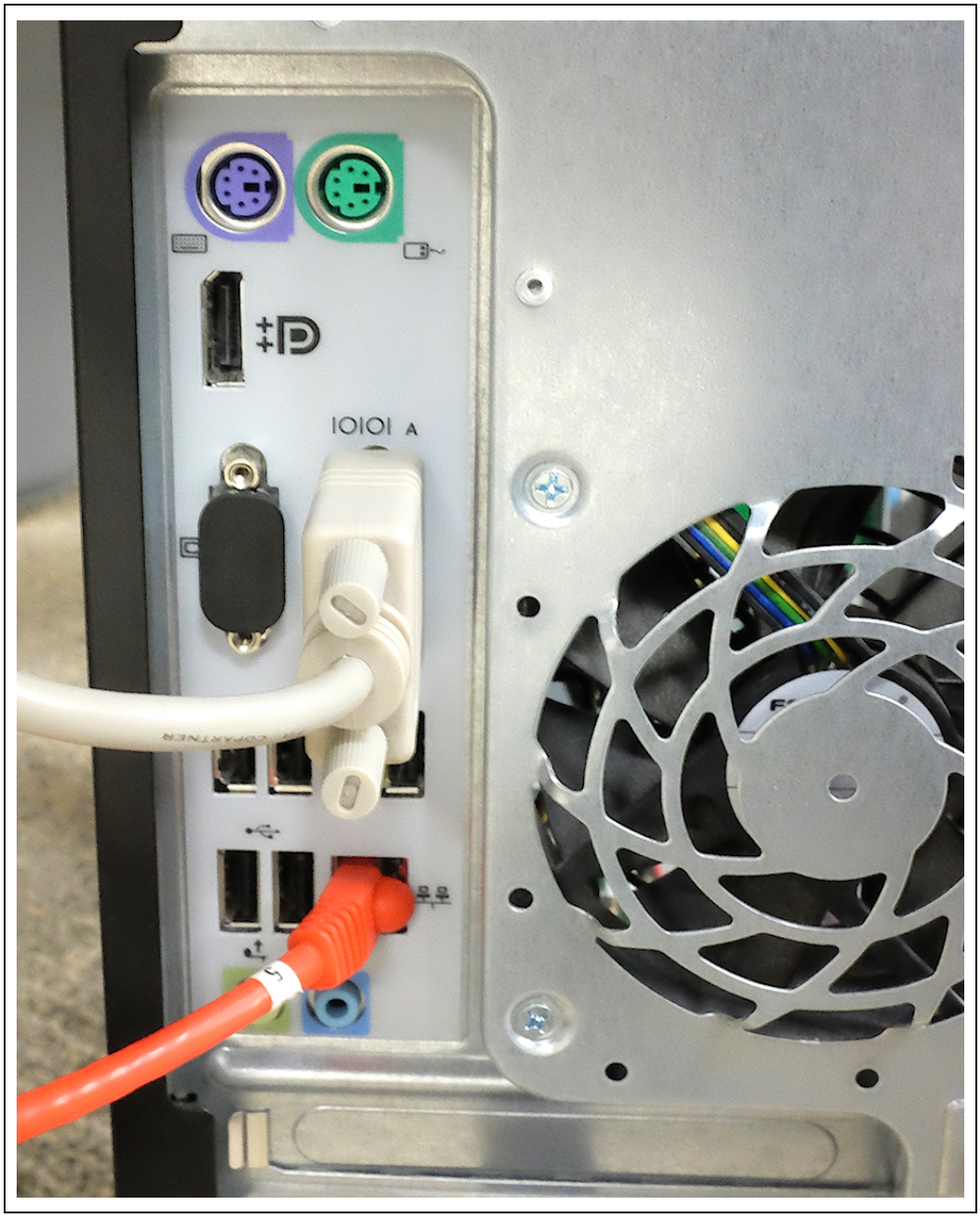


IMPORTANT: Large “X” marks in Figure 34 - Target Platform Serial Connector indicate serial ports you cannot use to connect the development host to the target platform. Make certain to use only the serial port connector labeled “1”.

NOTE: Optionally attach the target platform to an Ethernet network cable, and connect to the development host over Ethernet. Ethernet requires configuration to become functional, with either a static IP address or a DHCP configuration with a DHCP server on the network.

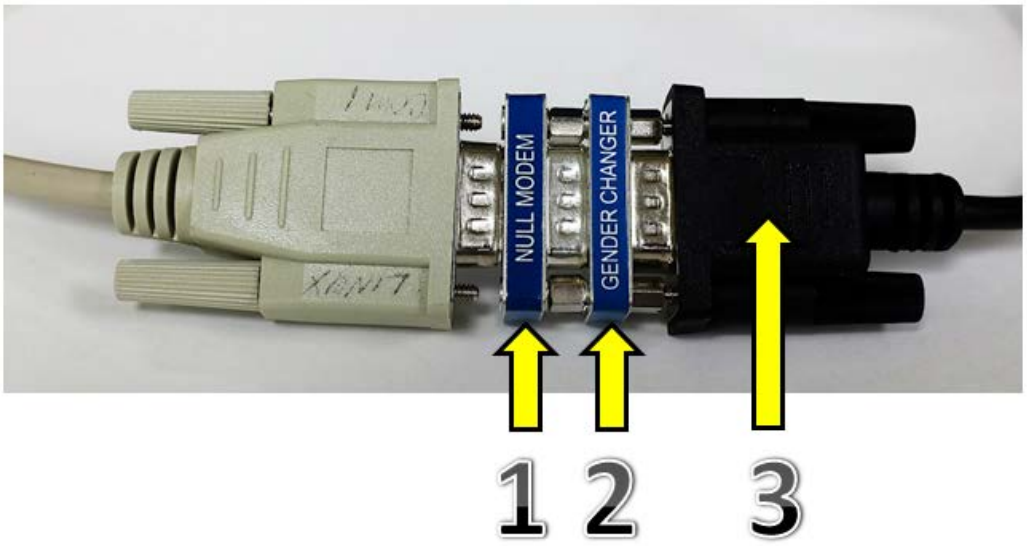
NOTE: The system requires that you provide development host hardware. Depending on the development host hardware you provide, the receptacle at the development host serial connection may vary from that shown in Figure 35 - Development Host Serial Connector. For information about the development host specifications, see Section 4.1.2 - Development Host Specifications.

Figure 35 - Development Host Serial Connector



NOTE: If you cannot establish a connection between the development host and target platform in the following steps, the serial cable connection between the development host and target platform may require the use of a null modem adapter and/or cable gender changer. See Figure 36 – Null Modem / Gender Changer.

Figure 36 – Null Modem / Gender Changer



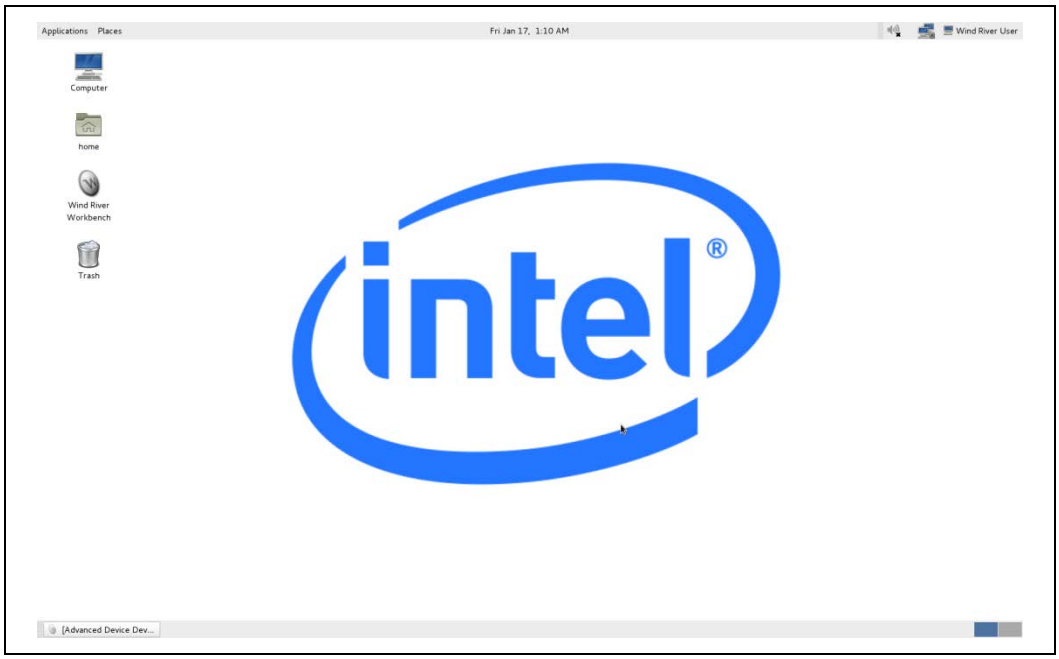
Item	Description
1	Null modem serial connector adapter
2	Gender changer serial connector adapter
3	Target platform DB9 (RS-232) serial port dongle labeled “1” at the location indicated by the arrow

Connect the development host power cord to a wall receptacle power source.

6.15 Explore the System

Start up the development host. The system loads to the Wind River Linux development host desktop. See Figure 37 - Development Host Desktop.

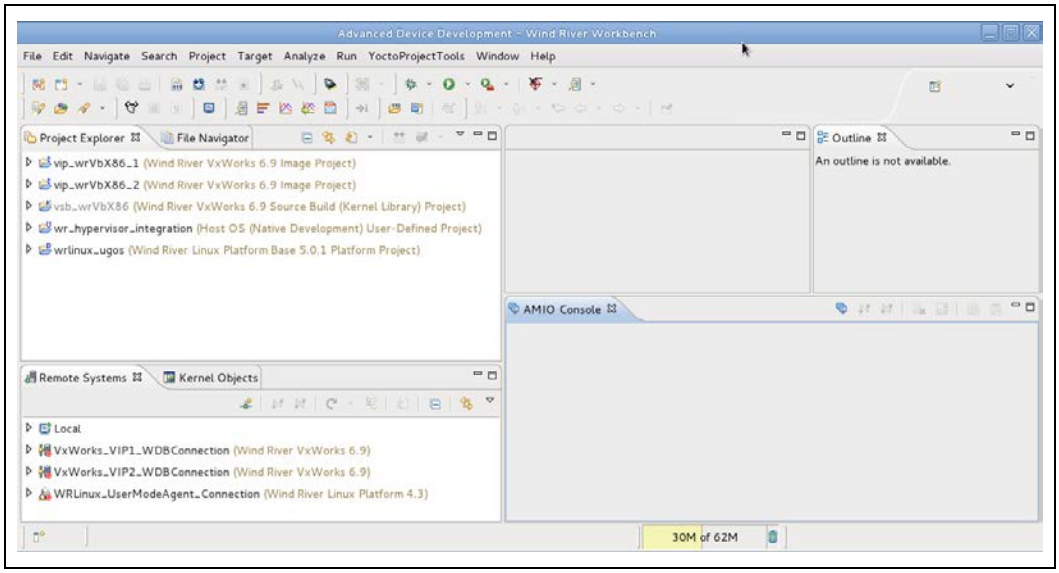
Figure 37 - Development Host Desktop



On the desktop, double-click the **Wind River Workbench** icon desktop icon.

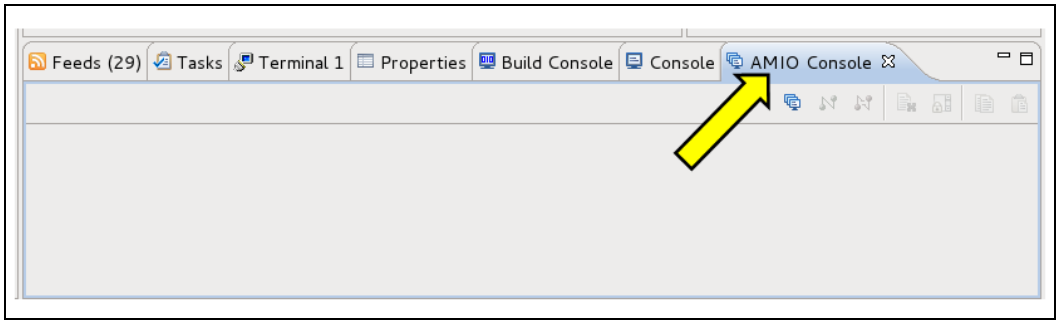
Wind River Workbench loads. See Figure 38 - Workbench Workspace.

Figure 38 - Workbench Workspace



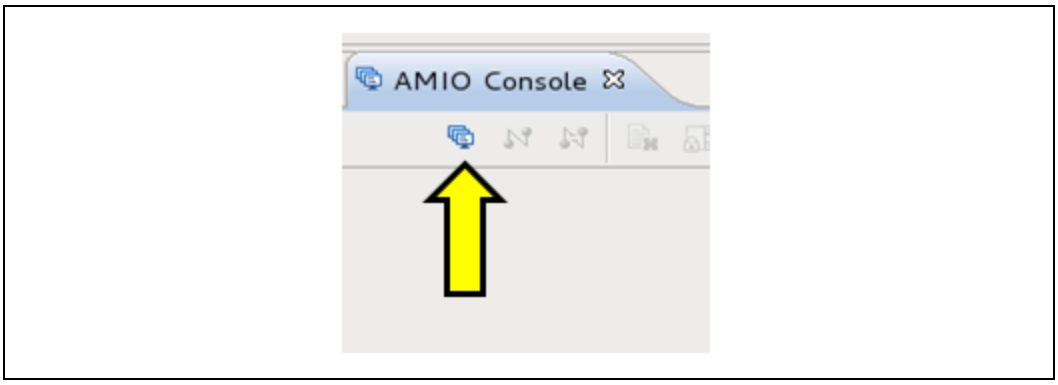
From the top menu, select **Window > Show View > AMIO Console**. The AMIO console appears. See Figure 39 - AMIO Console.

Figure 39 - AMIO Console



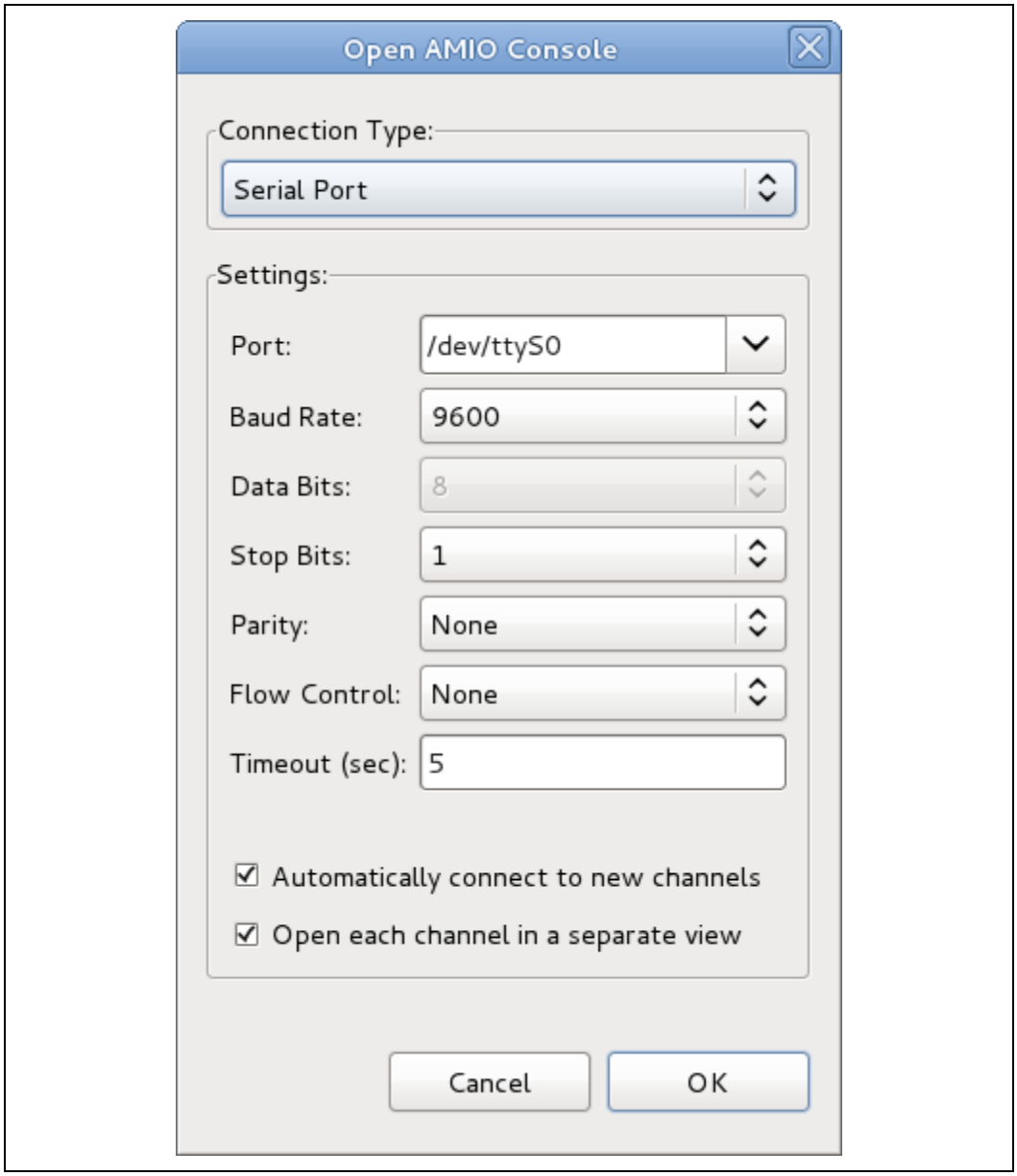
At the development host Workbench workspace, click the "Creates a connection for Application Multiplexed I/O" button. See Figure 40 - Multiplexed I/O Button.

Figure 40 - Multiplexed I/O Button



An **Open AMIO Console** window appears. See Figure 41 – Open AMIO Console.

Figure 41 – Open AMIO Console



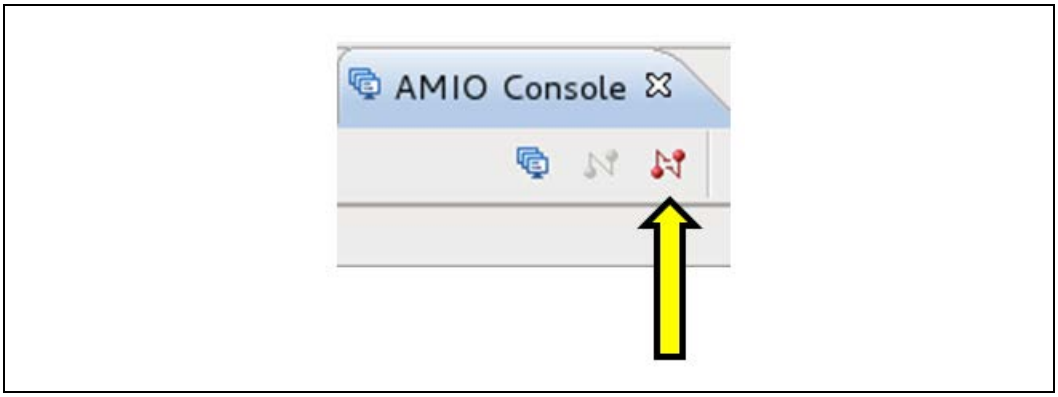
Select the parameters shown in Figure 41 – Open AMIO Console.

NOTE: If you are connecting through a USB-to-serial connector, you may not be able to connect using the **Port** parameter **/dev/ttyS0** above. If you are unable to connect using the **/dev/ttyS0**, try connecting with **/dev/ttyUSB0**. Later references to this connection in this document assume you use the **/dev/ttyS0** connection.

Click **OK**. This opens up an AMIO connection at the development host serial port.

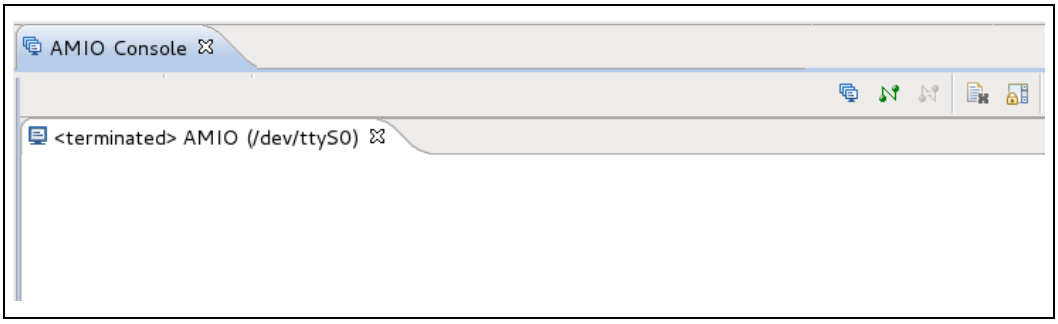
Near the bottom right section of the Workbench workspace, there is a grayed out "connected" icon adjacent to a red "disconnect" icon. See Figure 42 - Disconnect Icon. The red icon indicates the development host is listening for a connection to the target platform.

Figure 42 - Disconnect Icon



Optionally, click the red disconnect icon to close the development host listening connection. After doing this step, note that the green "connect" icon is enabled and the **/dev/ttyS0** console workspace shows the connection as **<terminated>**. See Figure 43 – Terminated Connection. Before continuing, make certain to re-click the green "connect" icon, and that the green icon has turned gray.

Figure 43 – Terminated Connection



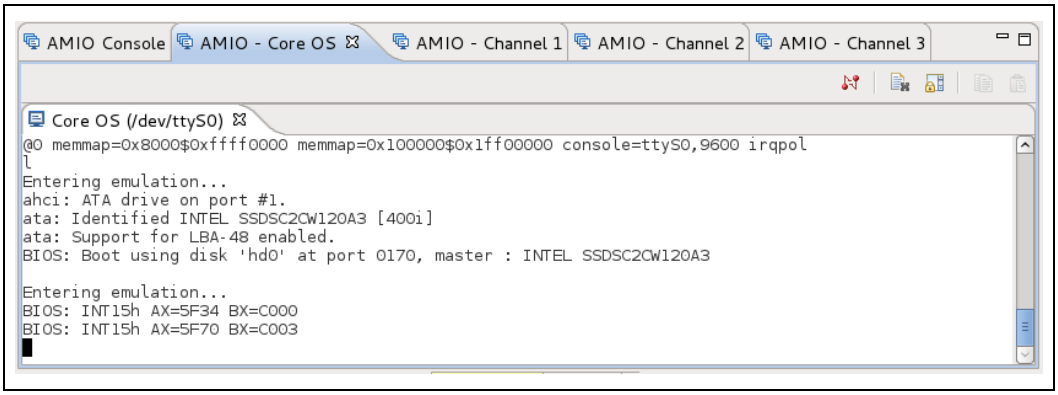
Double-click the **AMIO Console** tab. The AMIO console expands within the Workbench workspace.

Retrieve the *Target Host* USB media from the product packaging and insert it into a blue USB 3.0 port on the target platform.

Press and release the power switch on the target platform. The power indicator light on the target platform illuminates and the system starts.

As the system starts, screen output appears on the development host Workbench AMIO console. Separate AMIO consoles appear. Figure 44 - AMIO Consoles shows the console for the first instance of VxWorks. The figure also shows the tabs that correspond with each AMIO instance that appears.

Figure 44 - AMIO Consoles



NOTE: If not all AMIO consoles appear, then in Workbench go to **Window > Show View** and select the console you wish to view.

- **AMIO Console –** This console has no output. Optionally close this console.
- **AMIO - Core OS –** This displays hypervisor output.
- **AMIO - Channel 1** – This displays Linux OS output.
- **AMIO - Channel 2** – This displays output from the VxWorks OS 1.
- **AMIO - Channel 3** – This displays output from the VxWorks OS 2.

6.15.1 Default OS IP Address Assignment

Intel® Industrial Solutions System Consolidation Series virtual NIC (VNIC) assigns IP addresses to the guest operating systems by default as follows:

- **Windows* 7** – 10.0.0.2
- **Linux –** 10.0.0.3
- **VxWorks 1 –** 10.0.0.4
- **VxWorks 2 –** 10.0.0.5

6.15.2 Inter-OS Communication over the Target VNIC

Using the physical (serial cable) connection between the development and the target platforms, you can use the Workbench AMIO console to display the logical connection among the Linux and VxWorks shells.

NOTE: To physically connect the development host to the target platform, see Section 6.8 – Set Up the Target Host.

The OSes on the target reside on a supervisory layer called a *hypervisor*, which also provides a platform for the target system's VNIC. The VNIC provides a network infrastructure that allows the OSes to communicate.

Follow this procedure to demonstrate communication among OSes over the target platform VNIC. Because you monitor this communication on the development host, this likewise demonstrates communication between the development and target platforms.

6.15.2.1 VxWorks-to-Linux Communication

To demonstrate that a communication path exists from VxWorks to Linux, visible from the VxWorks side, use the ping command.

Double-click any console tab. The console workspace expands within Workbench.

Click the VxWorks 1 (**AMIO – Channel 2**) console tab. The VxWorks (**AMIO – Channel 2**) console tab appears.

At the VxWorks command line, type **ping "10.0.0.3"** and press **Enter**.

A response indicates that Linux received the ping communication from VxWorks. See Figure 45 - VxWorks to Linux Communication.

Figure 45 - VxWorks to Linux Communication

```
-> ping "10.0.0.3"

Pinging 10.0.0.3 (10.0.0.3) with 64 bytes of data:
Reply from 10.0.0.3 bytes=64 ttl=64 seq=0 time=1ms

--- 10.0.0.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 1 ms
rtt min/avg/max = 1/1/1 ms
value = 0 = 0x0
->
```

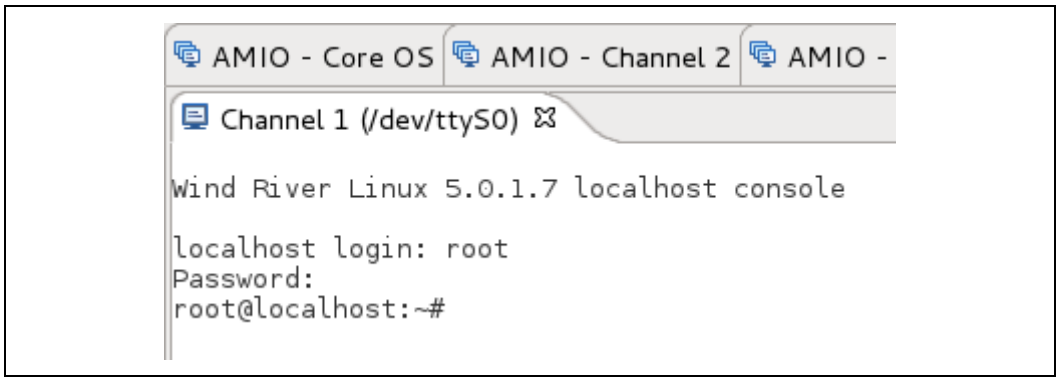
6.15.2.2 Linux-to-VxWorks Communication

To demonstrate that a communication path exists between Linux and VxWorks instances, use the ping command.

Go to the Linux (**AMIO – Channel 1**) console.

Login as **root** with the password **root**. The Linux command prompt appears. See Figure 46 – Linux Prompt.

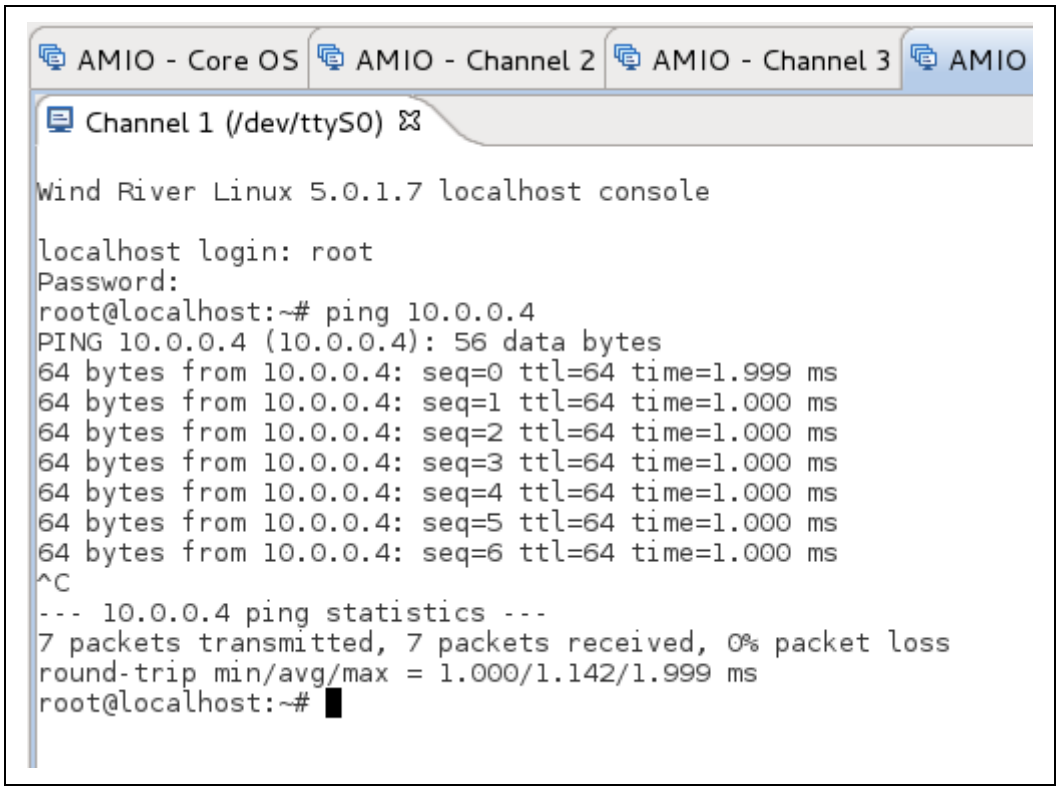
Figure 46 – Linux Prompt



At the command line, type **ping 10.0.0.4** and press **Enter.**

A response indicates that VxWorks 1 received communication from Linux. See Figure 47 - Linux-to-VxWorks Communication.

Figure 47 - Linux-to-VxWorks Communication



Press **CRTL+C** to stop the ping activity.

6.15.2.3 VxWorks-to-VxWorks Communication

Click the VxWorks 2 (**AMIO - Channel 3**) console tab. The VxWorks 2 (**AMIO - Channel 3**) console appears.

At the VxWorks prompt, type **ifconfig** and press **Enter**. Network information appears as output. See Figure 48 - Ifconfig Output.

Figure 48 - Ifconfig Output

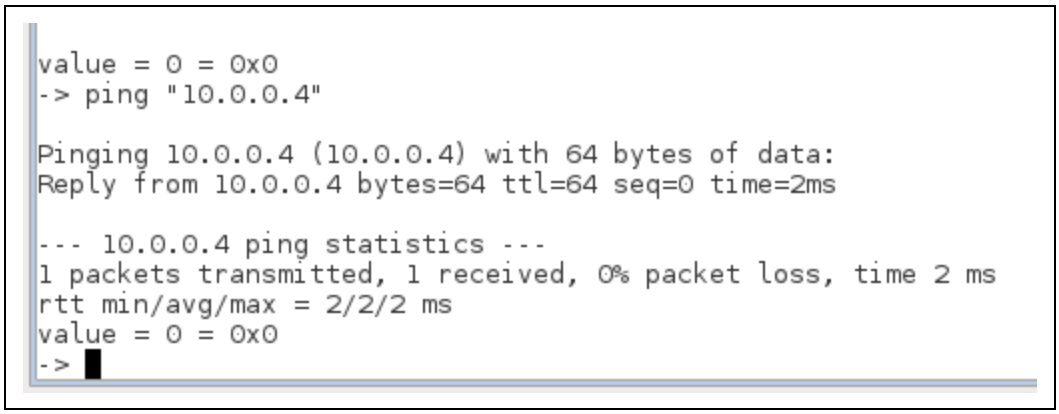
```
-> ifconfig
lo0     Link type:Local loopback  Queue:none
        inet 127.0.0.1  mask 255.255.255.255
        UP RUNNING LOOPBACK MULTICAST NOARP
        MTU:1500  metric:1  VR:0  ifindex:1
        RX packets:261 mcast:0 errors:0 dropped:0
        TX packets:262 mcast:0 errors:0
        collisions:0 unsupported proto:0
        RX bytes:14k  TX bytes:14k

vnic0   Link type:Ethernet  HWaddr 00:11:11:00:01:03  Queue:none
        inet 10.0.0.5  mask 255.255.255.0  broadcast 10.0.0.255
        UP RUNNING SIMPLEX BROADCAST MULTICAST
        MTU:1500  metric:1  VR:0  ifindex:2
        RX packets:285 mcast:27 errors:0 dropped:0
        TX packets:153 mcast:0 errors:0
        collisions:0 unsupported proto:0
        RX bytes:28k  TX bytes:12k

value = 0 = 0x0
-> 
```

The **10.0.0.5** content within the output indicates that you are at the VxWorks 2 prompt.

At the prompt, type **ping "10.0.0.4"** and press **Enter**.

A response indicates that VxWorks 1 received communication from VxWorks 2. See Figure 49 - VxWorks-to-VxWorks Communication.

Figure 49 - VxWorks-to-VxWorks Communication



Optionally perform this procedure from the VxWorks 1 Workbench AMIO console, while pinging the other VxWorks OS.

This concludes the overview and demonstration of the system's basic features and capabilities. To learn how to use the system in greater detail, proceed with the workflow in the chapter that follows.

§

7 Workflow 2: Develop With Preloaded Workbench Projects

7.1 About This Chapter

The Intel® Industrial Solutions System Consolidation Series (SCS) development host uses *Wind River Workbench* as its primary development tool. Use the Workbench development platform for innumerable development activities called *workflows*.

IMPORTANT: Before you perform this workflow, you must perform Workflow 1. Intel Corporation recommends performing all other workflows previous to this workflow.

This chapter includes both system *background information* and *instructions* for connecting and exploring basic system functionality.

- FIRST… Read and understand this chapter entirely.
- THEN… Re-read the chapter and perform the instructions in the workflow.

In this workflow, you use preloaded Linux and VxWorks (template) projects in Wind River Workbench to quickly develop a target platform image and boot it on the target hardware. This workflow helps provide you with basic skills using Workbench in order to reduce source build and compilation time. Once built, you then load the complete target image onto the target platform and boot it up. In this workflow you will have the opportunity to learn how to port your own source code to the VxWorks projects, which boot up from independent VM partitions on the target platform.

7.2 About Build / Rebuild

Within this procedure you are prompted to either **Build** or **Rebuild** a project.

Build compiles only files and changes that have been modified since the last full build, while **Rebuild** forces the recompilation of the entire project. The system cannot automatically detect modifications to certain types of files (like scripts). In such cases, a **Build** would not detect the changed file, but a **Rebuild** would.

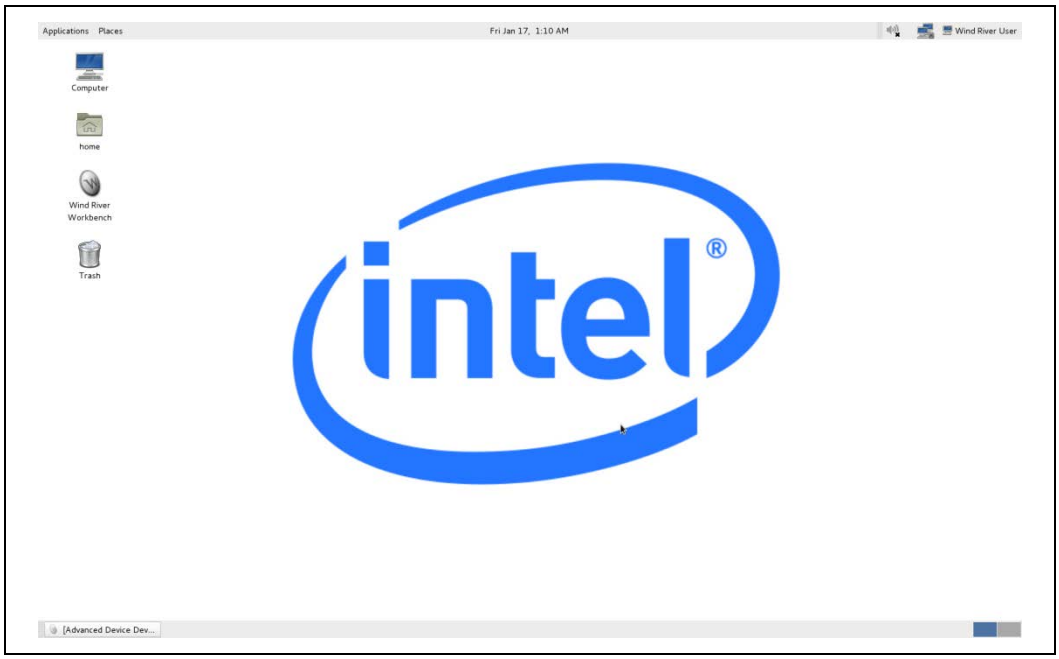
As a general rule, if you are modifying a source code file (such as .c or .h), a **Build** is appropriate. However, when changing another type of file, a **Rebuild** is the safer choice. Use **Rebuild** to ensure all changes are detected and recorded.

7.3 Start Up

Use the following steps after installing the development environment onto the development host's local hard drive.

Start the development host. The Wind River Linux desktop loads. See Figure 50- Linux Desktop.

Figure 50- Linux Desktop

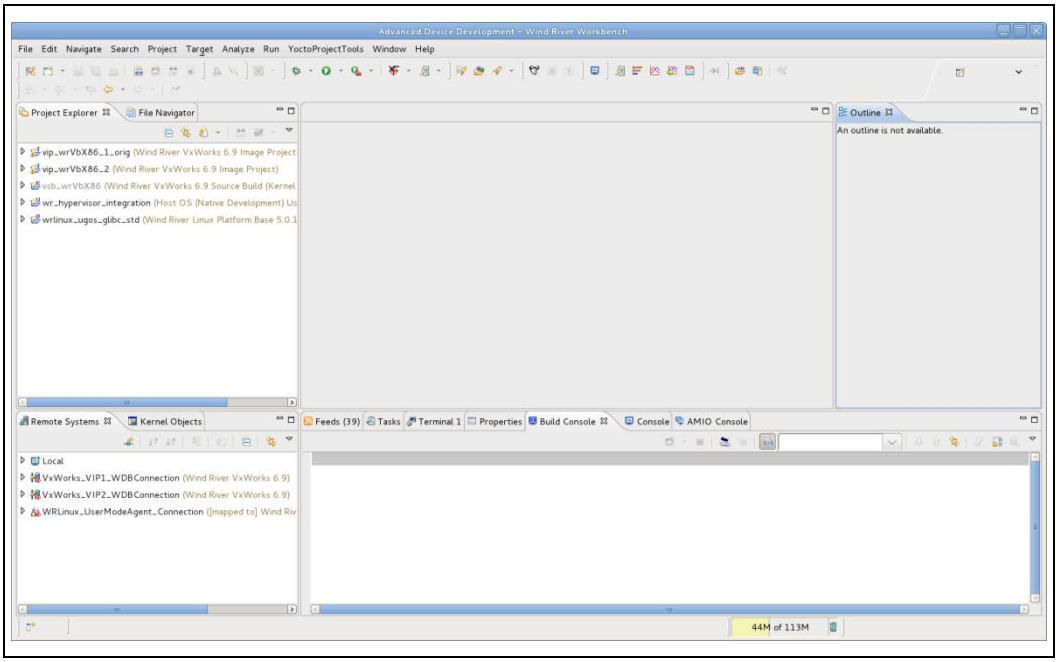


Open Workbench: Go to the desktop and double-click the **Wind River Workbench** icon. See Figure 51 - Workbench Icon.

Figure 51 - Workbench Icon

Wind River Workbench loads. See Figure 52 - Workbench Workspace.

Figure 52 - Workbench Workspace



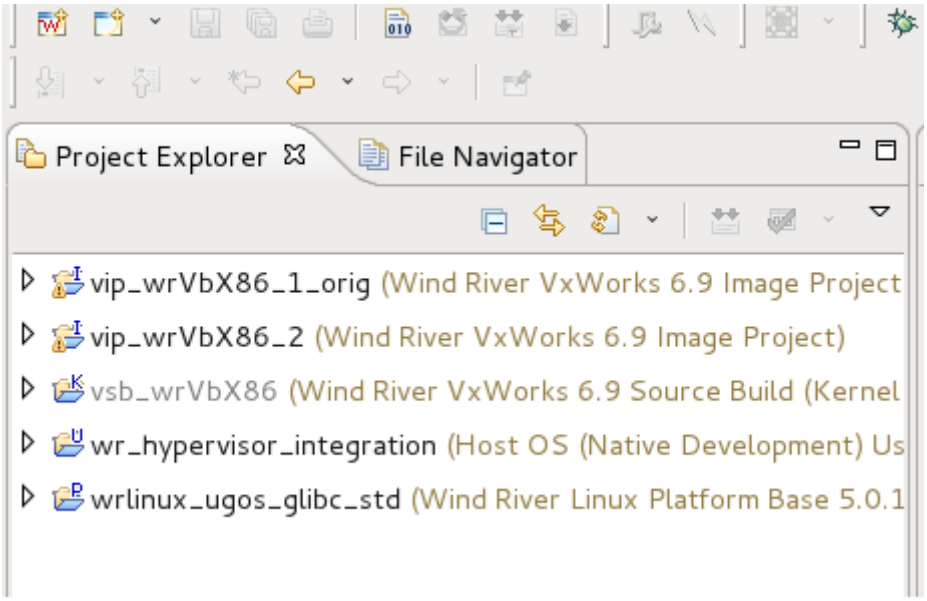
The *Project Explorer* is your main graphical interface for working with projects. You use it to create, open, close, modify, and build projects. You can also use it to add or import application code, to import or customize build specifications, and to access your version control system.

Using the Project Explorer, you can visually organize projects into structures that reflect their inner dependencies, and therefore the order in which they are to be compiled and linked.

7.4 Workbench Projects

The Workbench development environment uses *projects* as the building blocks for activities such as the loading of applications onto the target platform OSes. Figure 53 - Project Explorer shows several projects as they appear in Workbench's top workspace console, the Project Explorer.

Figure 53 - Project Explorer



Workbench uses *preconfigured projects*. These projects are prebuilt packages that help reduce time you spend in development effort.

The development host system comes pre-loaded with five preconfigured projects:

- **vip_wrVbX86_1** – This is the VxWorks image project (VIP) that provides the build information for the first VxWorks (VxWorks 1) OS that appears on the target platform. This project is configurable, for example, to include source code for applications you have created to run on VxWorks.
- **vip_wrVbX86_2** – This is a VIP just like the VxWorks 1 project (vip_wrVbX86_1) immediately above. It corresponds to the VxWorks (VxWorks 2) OS that appears on the target platform. This project is also configurable.
- **vsb_wrVbX86** – This is a VxWorks source build library that provides the building blocks for the VIPs mentioned above. This project is not configurable, and thus requires no user modification or interaction.
- **wr_hypervisor_integration** – This is a hypervisor integration project that combines the Linux and the two VxWorks images and creates the single hypervisor target image. This image is used to boot the target. This type of project has limited configurability. If you create your own Linux or VxWorks project, you can edit the makefile to use your project instead of the default one. You can also update the script files used to allocate hardware elements to the various VMs.
- **wrlinux_ugos_glibc_std** – This is a Wind River Linux platform project that provides the build information for the Linux virtual machine environment that appears on the target platform.

7.5 Modify Code in a Preconfigured OS Project

In this section you have the opportunity to write some simple source code into the preconfigured Workbench project image for VxWorks.

NOTE: You will have the opportunity to import code into the Workbench Linux project in a later workflow.

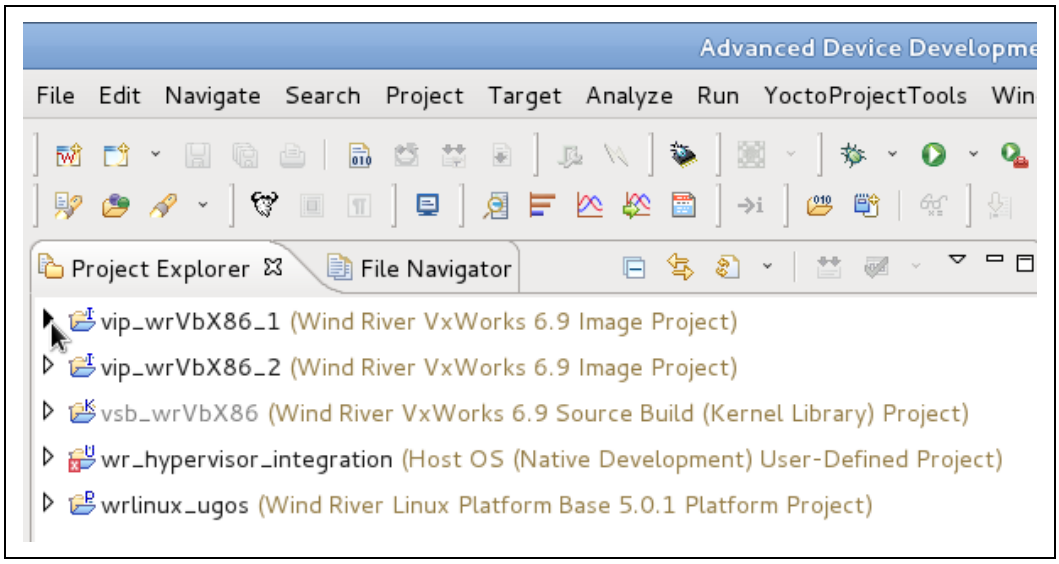
When you finish importing the code, you compile the projects, use Workbench to build the target platform boot image, copy it to USB, and boot the target platform from that image.

7.5.1 Modify Simple Code Line in VxWorks 1 Project

This procedure provides instruction for inserting a single line of code into the VxWorks 1 project.

In **Project Explorer**, expand the VxWorks project by clicking the triangular icon adjacent to **vip_wrVbX86_1**. See the darkened project icon in Figure 54 - VxWorks Project Icon.

Figure 54 - VxWorks Project Icon

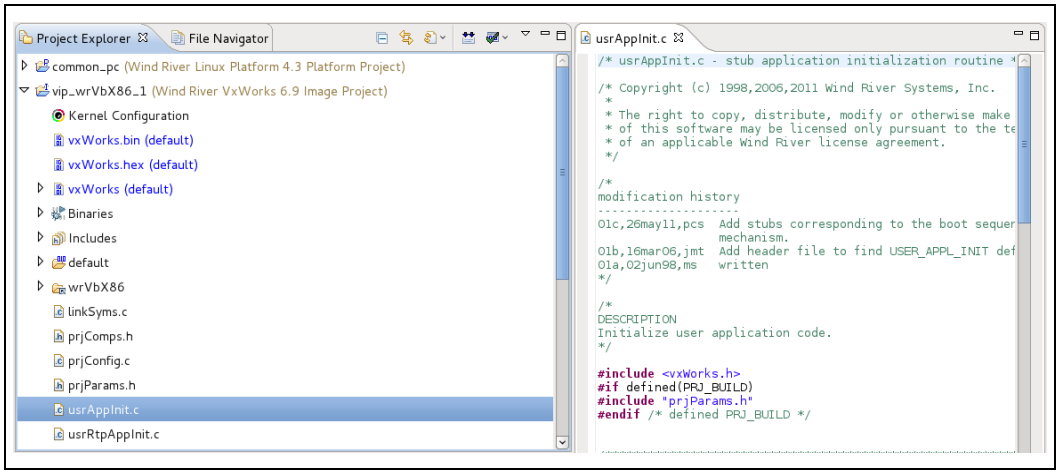


The VxWorks project expands.

In the listing that appears below the VxWorks line item, scroll down to the **usrAppInit.c** object.

Double-click the **usrAppInit.c** object. To the right of Project Explorer a **usrAppInit.c** work pane and **Outline** pane appear. See Figure 55 - usrAppInit.c.

Figure 55 - usrAppInit.c



Double-click the **usrAppInit.c** tab. The **usrAppInit.c** work pane expands.

NOTE: usrAppInit() is an application entry-point routine that can be modified to start your kernel application automatically at boot time. This is explained in further detail in the *VxWorks Kernel Programmer's Guide* which you can access through Workbench Help. Alternatively, for starting RTP applications refer to the *VxWorks Application Programmer's Guide* for details on using the usrRtpAppInit.c routine stub.

Within the **usrAppInit.c** work pane just below the banner at the top of the file locate the following line of code:

```
#include <vxWorks.h>
```

Insert the following just above the **<vxWorks.h>** include statement.

```
#include <stdio.h>
```

Place the cursor at the end of the code line below:

```
/* add application specific code here*/
```

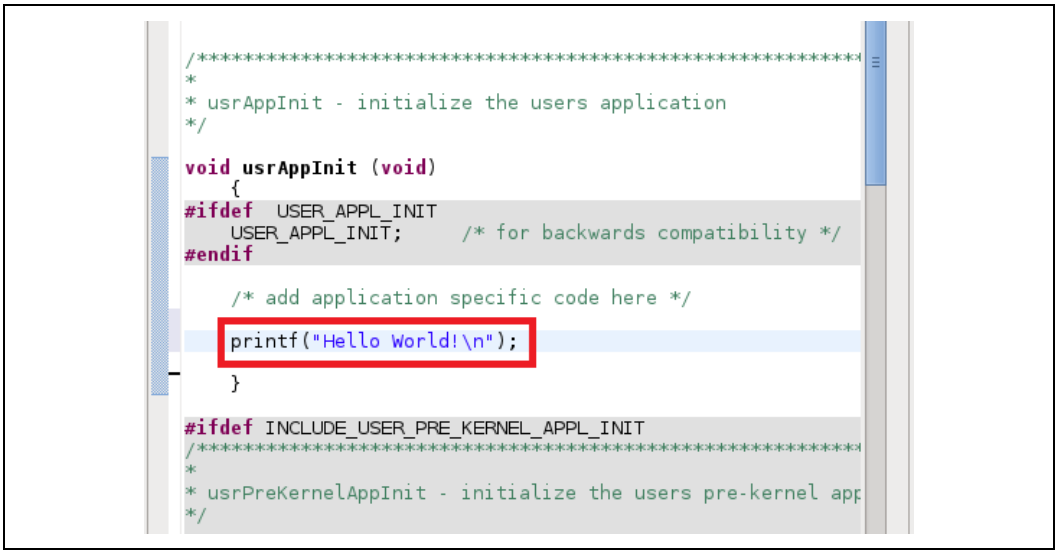
Press **Enter** twice. The cursor advances downward.

Type the following code:

```
printf("Hello World!\n");
```

See the boxed content in Figure 56 – Print File Code.

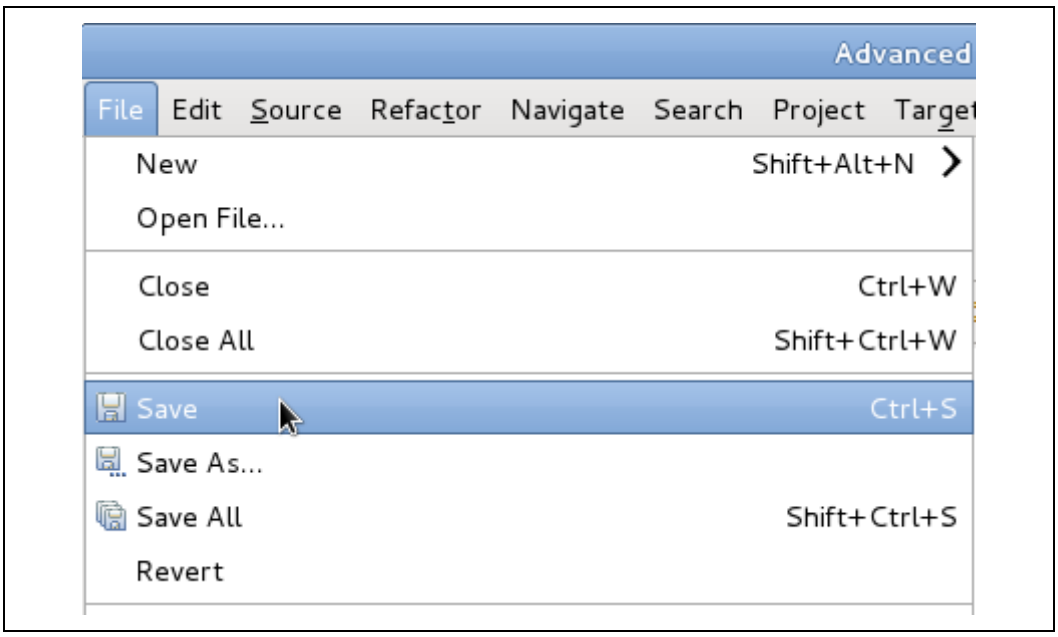
Figure 56 – Print File Code



You may optionally insert your own code in the space above into the VxWorks project.

Go to **File > Save**. See Figure 57 – File > Save.

Figure 57 – File > Save



The file saves to the system.

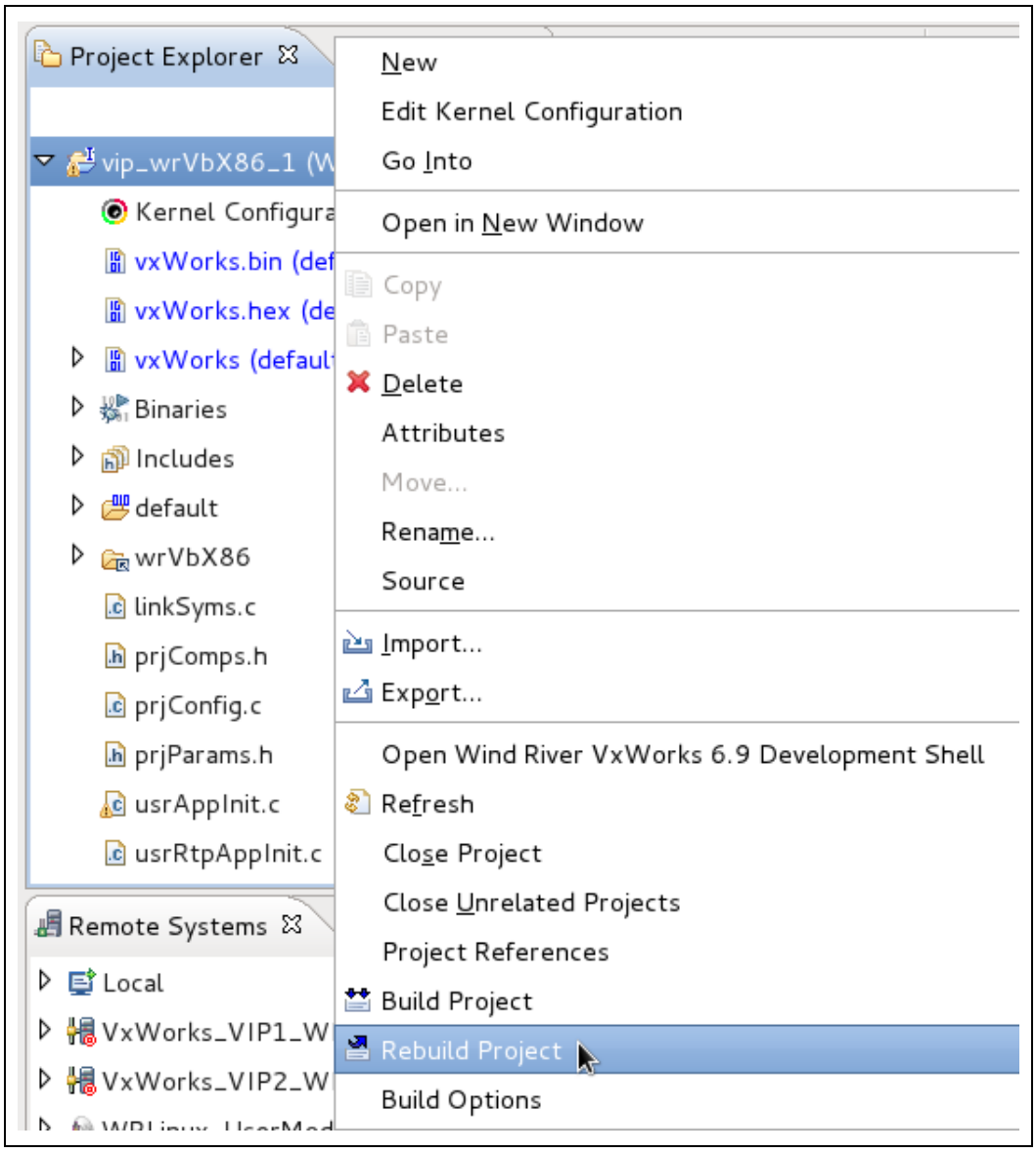
Repeat this procedure to embed source code for VxWorks #2 (**vip_wrVbX86_2**).

7.5.2 Build the Hypervisor Integration Project

In Project Explorer, go to and right-click the **vip_wrVbX86_1** object.

Select **Rebuild Project**. See Figure 58 – Rebuild Project.

Figure 58 – Rebuild Project



A **Rebuild Project – vip_wrVbX86_1** window appears (see Figure 59 – Rebuild Project) and a **Build Console** at the bottom of Workbench (see Figure 60 – Build Console) displays lines of scrolling code.

Figure 59 – Rebuild Project

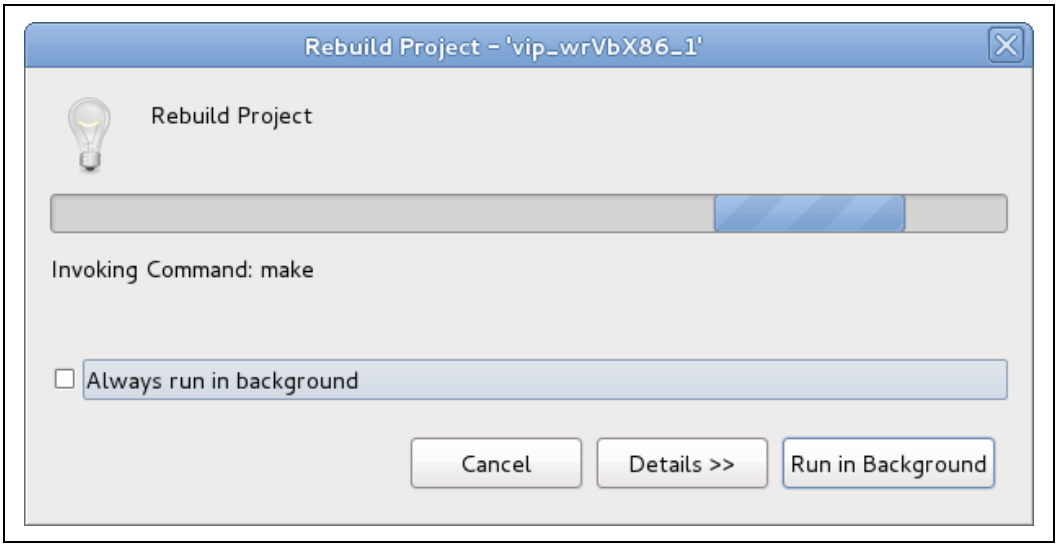
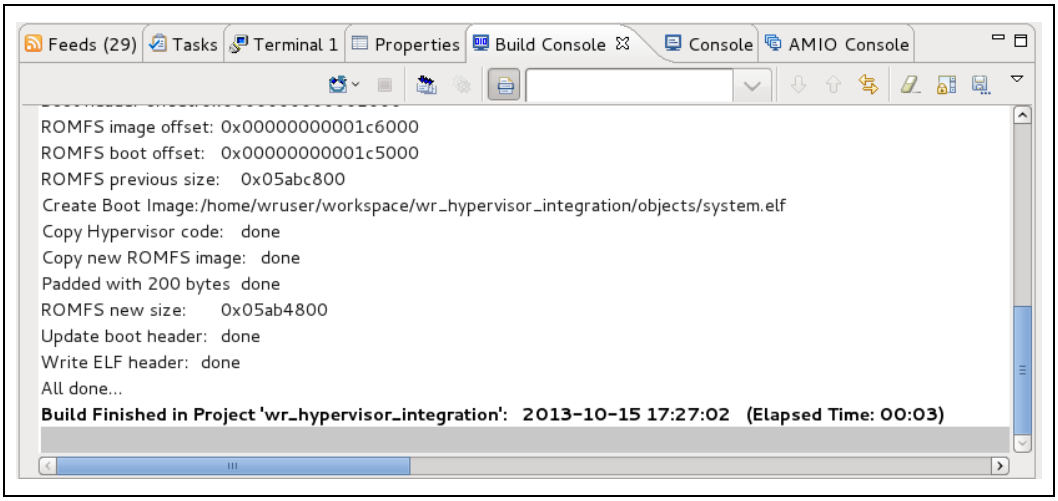


Figure 60 – Build Console



When the system finishes rebuilding the project, the **Rebuild Project – vip_wrVbX86_1** window disappears and returns to Wind River Workbench.

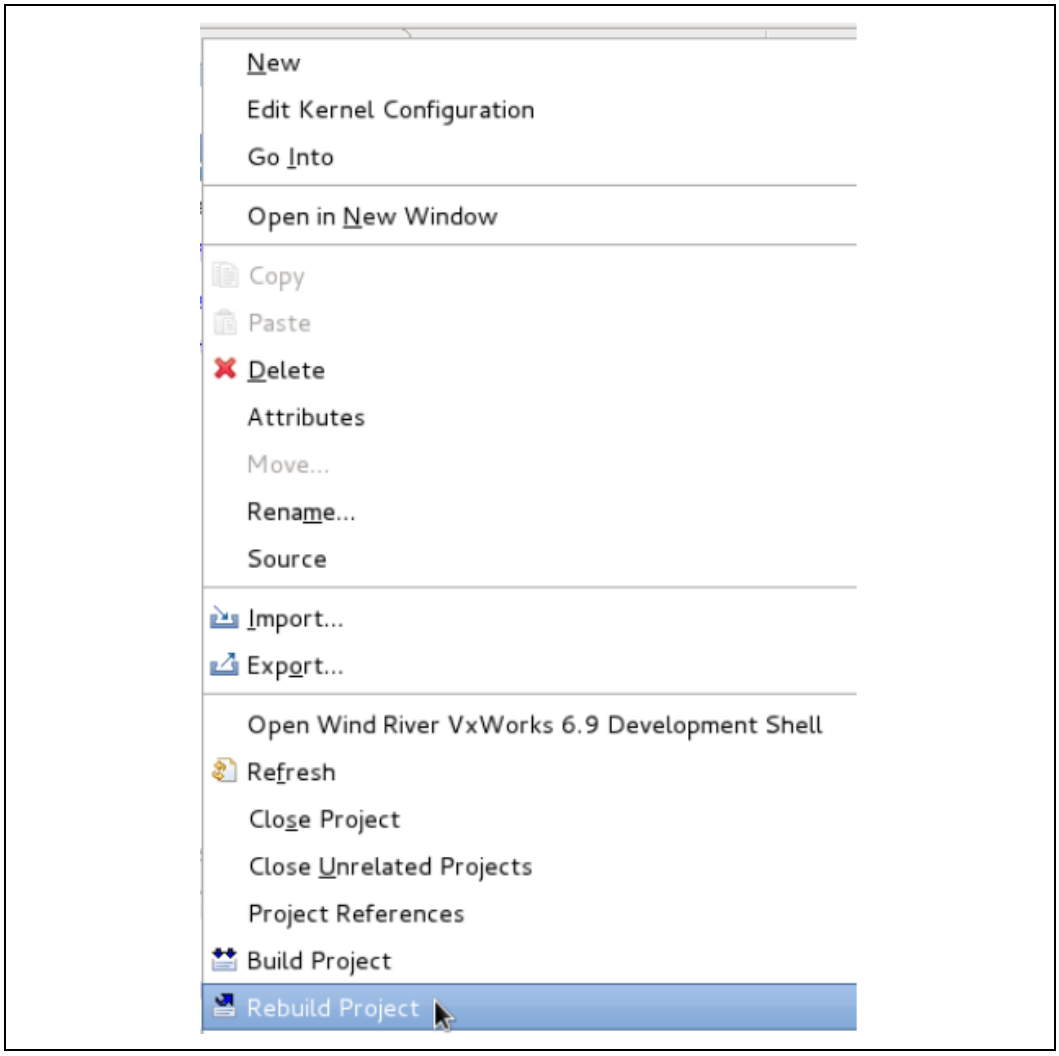
Repeat this procedure for the VxWorks 2 project (**vip_wrVbX86_2**).

In the procedure that follows, you instruct Hypervisor to collect the changes you just made in the VxWorks 1 project. As it collects these changes, Hypervisor also gathers any other changes you may have made in the VxWorks 2 (**vip_wrVbX86_2**) and Linux (**wrlinux_ugos_glib_std**) projects. All of the changes contribute to creating an image you can later use to boot the target.

Go to and right-click the **wr_hypervisor_integration** object.

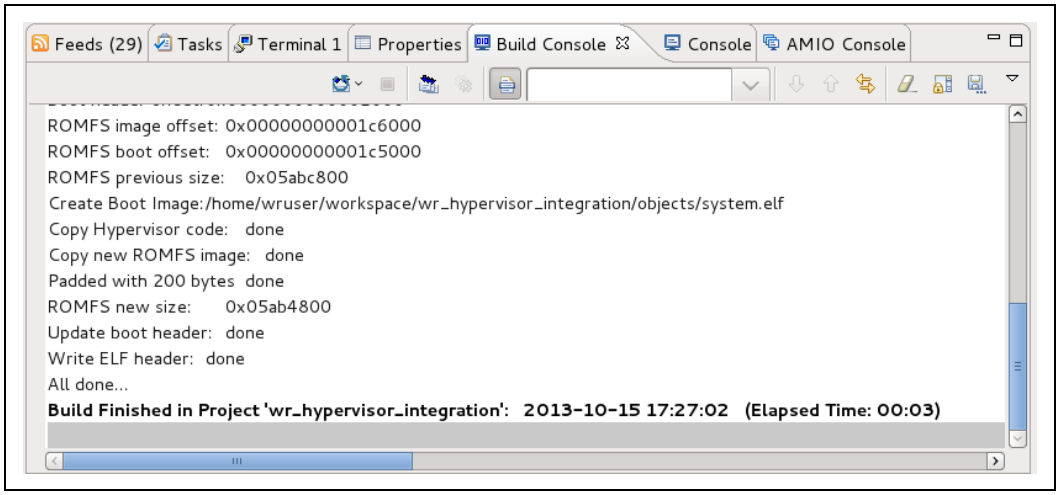
Select **Rebuild Project**. See Figure 61 – Select Rebuild Project.

Figure 61 – Select Rebuild Project



A **Rebuild Project – wr_hypervisor_integration** window appears and a **Build Console** pane at the bottom of Workbench displays lines of scrolling code. See Figure 62 - Build Console.

Figure 62 - Build Console



While the system rebuilds the **wr_hypervisor_integration** project, the system copies information from the other projects in Project Explorer. This process consolidates this information into a file called **system.elf**. The **system.elf** file comprises the image containing the modifications and configurations (including any code you create) that the target platform uses to boot.

Depending on the size of project you rebuild, after a few moments the **Rebuild Project** window disappears.

7.5.3 Copy the System.Elf File to Boot Media

While there are several methods to move the **system.elf** file from the development host to the target platform, the easiest method is to copy the **system.elf** file to USB media and boot the target platform from that media.

Follow these steps to perform this copy procedure.

CAUTION: Intel Corporation provides you with the target platform media USB for copying the system.elf file from the development host to the target platform. However, copying data onto the target platform USB media may cause the data on the media to be overwritten. Make certain to back up data before using the media. Failure to do so may result in the loss of the data on the media.

IMPORTANT: Intel Corporation provides you with the target platform media USB for copying the **system.elf** file from the development host to the target platform. While you may use any Linux-formatted USB media, this procedure assumes you use the *Target Host* USB media.

At the development host, insert the *Target Host* USB media into an open USB port. The USB media mounts to the Linux file system.

NOTE: You may optionally insert any Linux-formatted USB media (with 16 GB or more free space) into an open USB port.

Open the *Target Host* USB media using the development host Linux File Explorer.

Open the **/images** directory and find the **system.elf** file.

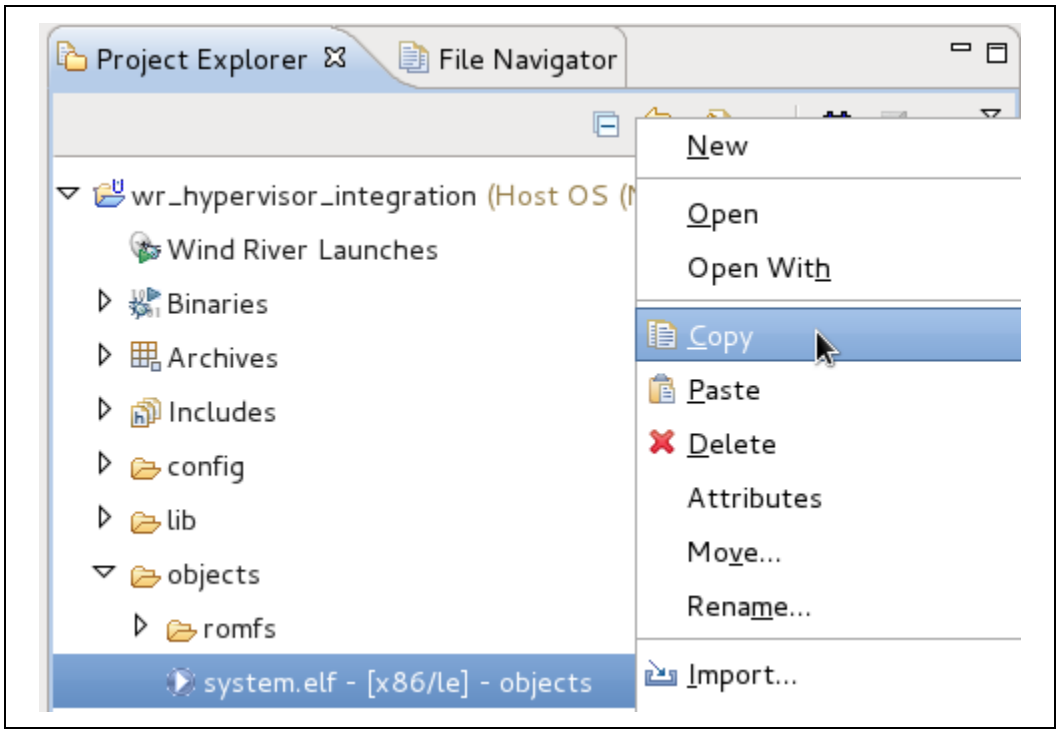
Rename the **system.elf** file to **system.elf.factory**. The file you rename in this step is a default factory-configured **system.elf** file which you may later wish to use to boot the target platform. By renaming it, you are protecting it from being overwritten in the following steps.

In Workbench Project Explorer, click the **wr_hypervisor_integration** project and expand it.

Expand the **Objects** folder.

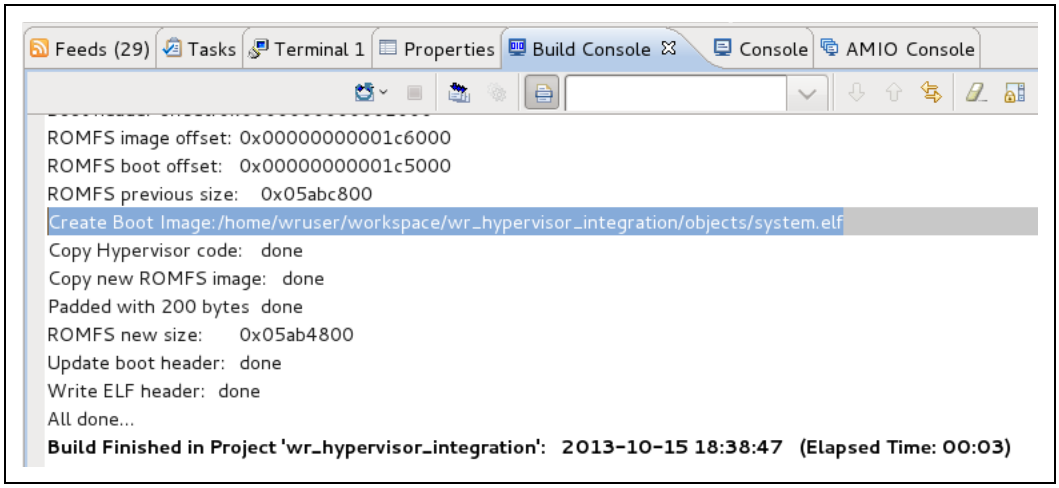
Right-click the **system.elf** object and select **Copy**. See Figure 63 – System.elf Copy.

Figure 63 – System.elf Copy



You may optionally use a command line or the Linux file explorer to copy the **system.elf** file from the location indicated in the **Build Console**. For a path to the **system.elf** file, see the darkened content in Figure 64 – System.elf Directory.

Figure 64 – System.elf Directory



In Workbench, close the AMIO channel consoles.

Minimize Workbench.

Use Linux File Explorer to navigate to the following directory of the USB media:

```
/target_usb/images
```

Paste the **system.elf** file into the directory.

After the file finishes copying, unmount the USB media and remove it from the development host.

7.6 Configure Target Platform BIOS to Boot from USB Media

Before booting the target platform from USB media, you first configure the target platform BIOS to boot from USB media.

NOTE: To ensure that you start the target platform from USB media, follow this procedure each time you need to boot from USB media.

Shut down the target platform and wait 5 seconds.

Ensure that no other bootable media are inserted into the target platform.

Place the bootable USB media into an open USB port (preferably a blue USB 3.0 port).

NOTE: For a faster boot, Intel Corporation recommends you connect the boot media to a USB 3.0 port on the target platform. Arrows in Figure 65 - USB 3.0 Ports provide the locations of two target platform USB 3.0 ports.

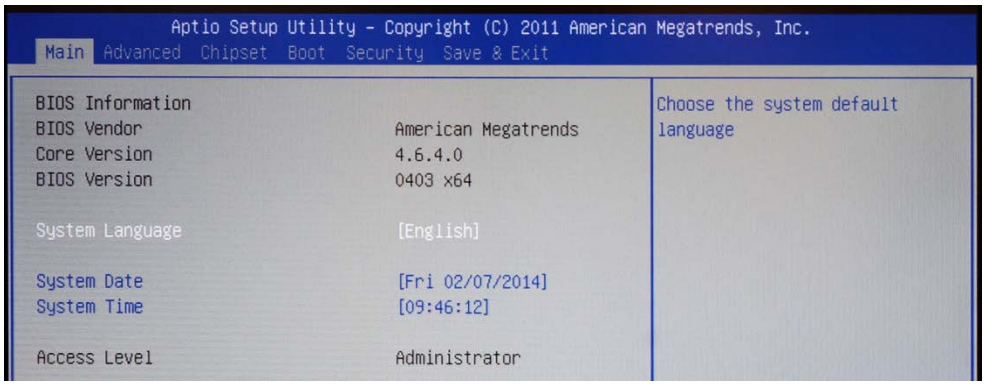
Figure 65 - USB 3.0 Ports

Press and release the target platform power button. The target platform begins to start.

As the target platform begins to start, repeatedly press the **DELETE** button.

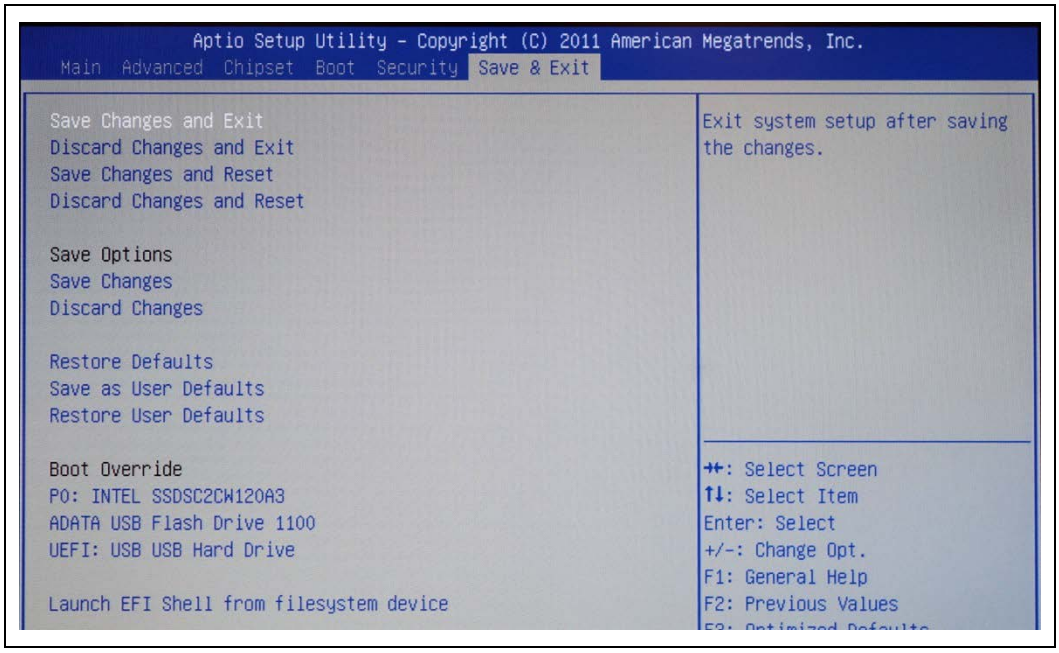
The target platform enters the BIOS **Main** tab. See Figure 66 – BIOS 1.

Figure 66 – BIOS 1



Use the right-arrow key to go to the **Save & Exit** tab. See Figure 67 – BIOS 2.

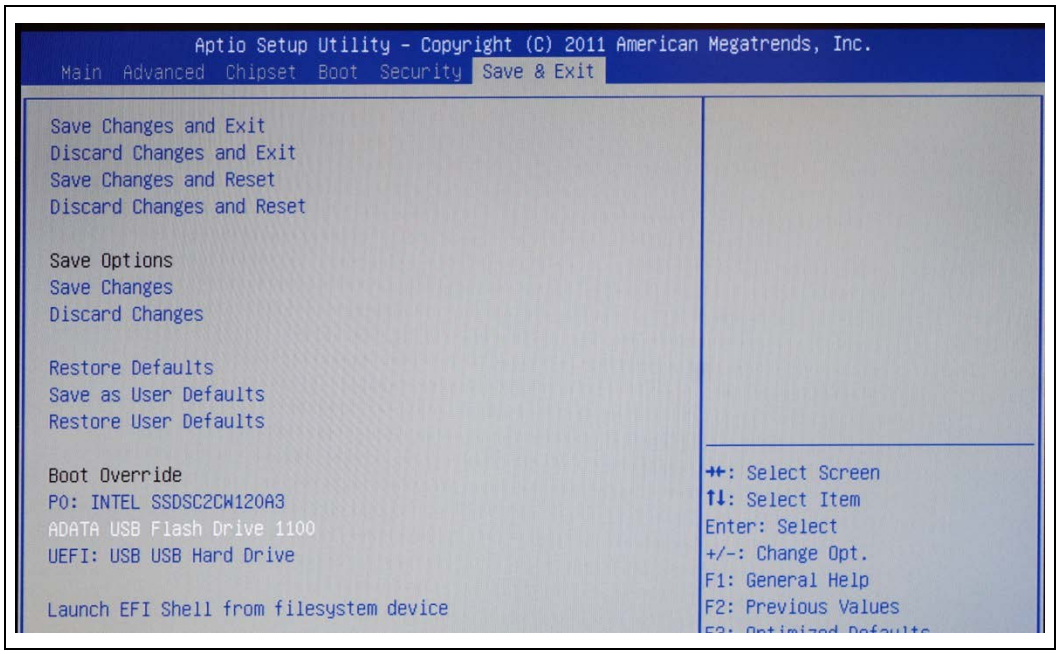
Figure 67 – BIOS 2



Use the down-arrow key to move the highlighted selection to the USB media. See Figure 68 – BIOS 3.

NOTE: In this example, the USB media is named **ADATA USB Flash Drive 1100**. Your USB media may have a different name.

Figure 68 – BIOS 3



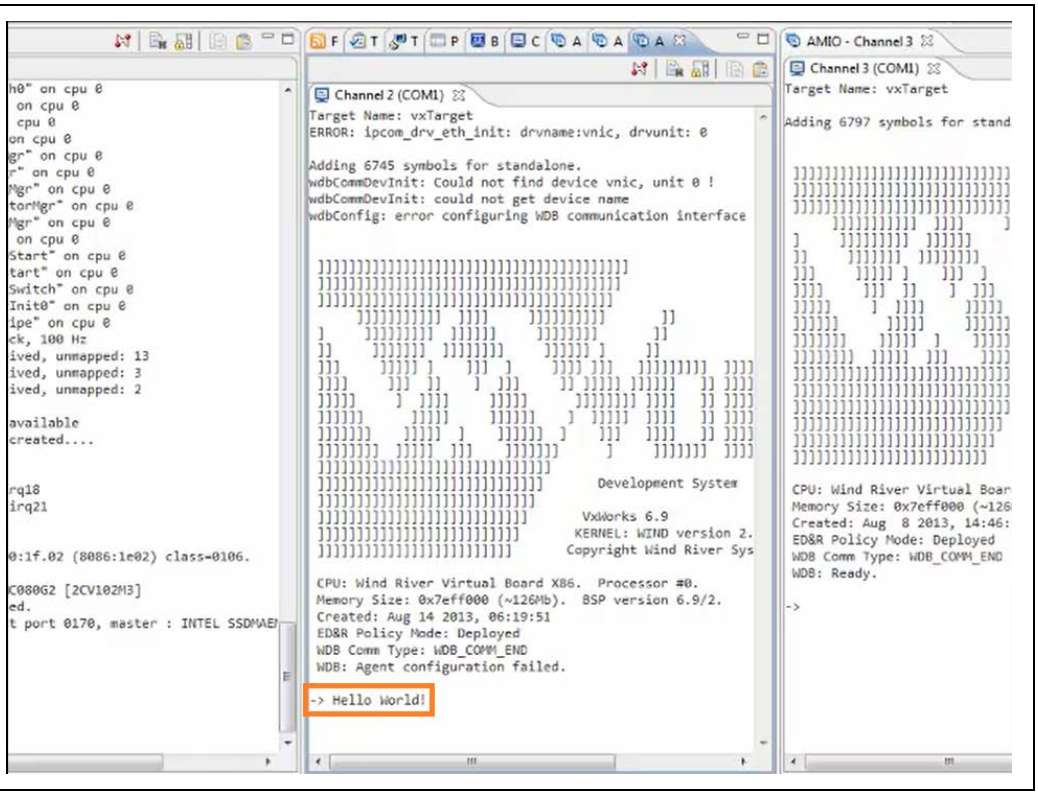
Press **Enter**. The target platform boots from USB media.

As the system starts, communication activity appears on the development host AMIO console. Several console tabs appear within the AMIO pane:

- **Core OS –** This shows the Hypervisor I/O
- **Channel 1 –**This shows the Linux I/O
- **Channel 2 –** This shows the I/O for VxWorks #1
- **Channel 3 –** This shows the I/O for VxWorks #2

The code you inserted into the **usrAppInit.c** object in the development host VxWorks project runs and displays. See the boxed content in Figure 69 – AMIO Consoles.

Figure 69 – AMIO Consoles



This concludes a basic demonstration of working with preconfigured Workbench projects.

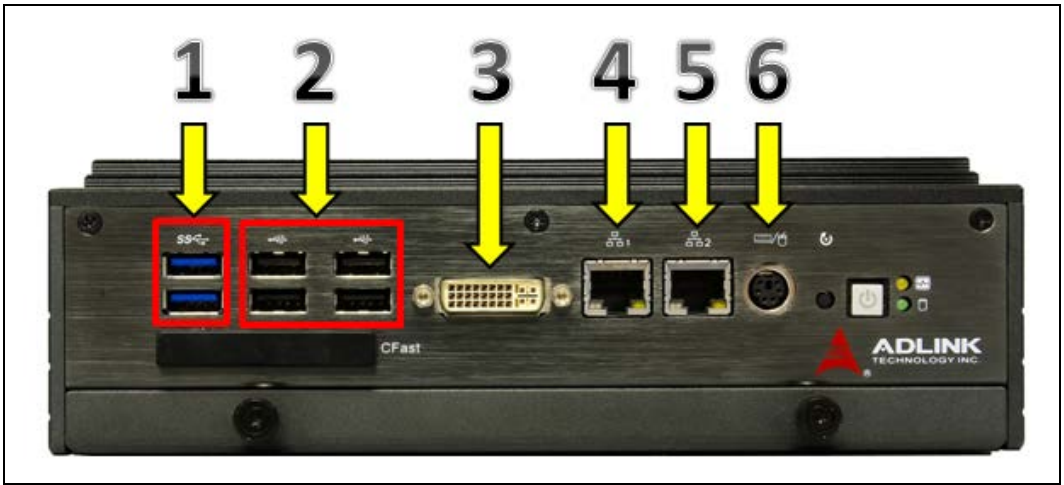
§

Appendix A – Default I/O Device Assignment

A.1 Default Physical Device Allocations

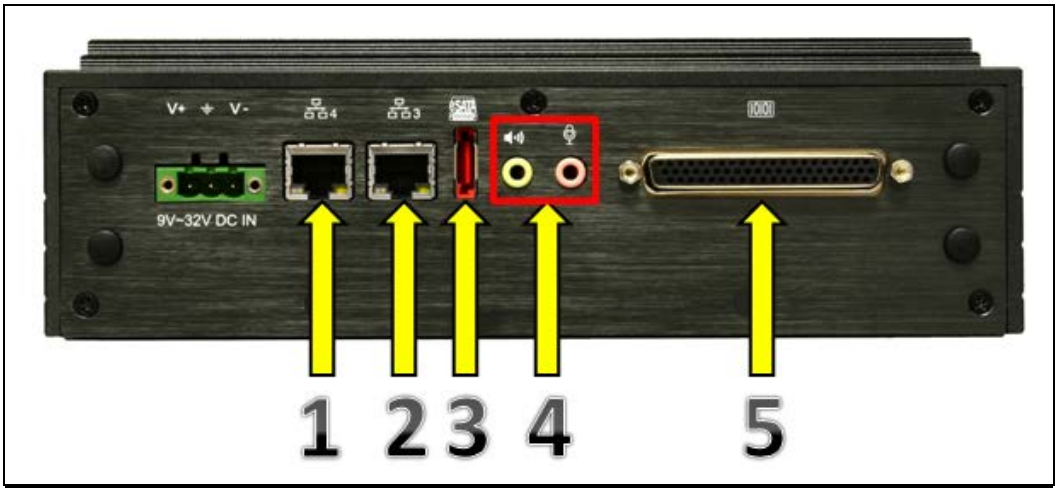
Intel® Industrial Solutions System Consolidation Series SCS comes with preconfigured physical device allocations as shown in Figure 70 – Target Platform Devices 1 and Figure 71 - Target Platform Devices 2.

Figure 70 – Target Platform Devices 1



Item #	Device Type	Assigned to VM	Comment
1	USB 3.0	Linux	Denoted by blue connector color.
2	USB 2.0	Windows	Denoted by black connector color
3	Video	Windows	Windows graphics
4	Ethernet	Windows	This device is driven by an Intel driver.
5	Ethernet	Windows	This device is driven by an Intel driver.
6	PS2	(NA)	Not supported by this implementation of SCS.

Figure 71 - Target Platform Devices 2



Item #	Device Type	Assigned to VM	Comment
1	Ethernet	Linux	This device is driven by a Realtek driver.
2	Ethernet	Linux	This device is driven by a Realtek driver.
3	eSATA	(NA)	Not supported by this implementation of SCS.
4	Audio	(NA)	Not supported by this implementation of SCS.
5	Serial	(NA)	Non-modifiable device preconfigured to support serial connection between development host and target platform via AMIO console.

§

Appendix B - Target Platform Hard Drive Recovery Instructions

CAUTION: This procedure provides instructions to restore the target platform hard drive to its original configuration before Windows installation. DO NOT perform this procedure as a part of preparation for first use of the system. Use the procedure if you believe the contents of the hard drive have been irretrievably corrupted or otherwise damaged.

Performing this procedure will erase all data on the hard drive, including partitions and the Windows operating system.

Use this procedure to restore the target platform hard drive to its original condition before Windows installation.

B.1 Configure BIOS to boot from USB

Shut down the target platform.

Insert the *User Support USB* media.

Boot the target platform into BIOS by pressing the **Delete** key repeatedly during startup. The system loads the BIOS settings system.

Go to **Boot > Hard Drive BBS Priorities > Boot Option #1 > [USB Flash Drive]**.

Press **Enter**.

Press **Esc**.

Go to **Save & Exit > Save Changes and Exit**.

Press **Enter**. Press **Enter**. The system reboots.

B.2 User Support OS Login

At the Debian GNU Linux login screen, use the following logon credentials:

SCS login: root

Password: scsadmin

B.3 Recover Hard Drive

Type **cd scsadmin** and press **Enter**.

Type **./restore_factory_hd** and press **Enter**.

Type **init 0** and press **Enter**.

The system shuts down.

Remove the User Support USB media before the system restarts.

SCS Target HD restoration is complete.

Appendix C - How to Utilize Shared Memory from an Application

Note: The shared memory region is fixed to 8 MB.

C.1 Linux

C.1.1 Includes

```
#include <sys/types.h>
#include <sys/stat.h>
#include <fcntl.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <ctype.h>
#include <errno.h>
#include <string.h>
```

C.1.2 Open

```
fd = open( device_name, oflags)
```

Parameters:

device_name - “/dev/win_lx_shared_memory”

oflags – O_RDWR

Return Value:

fd – filedescriptor pointing to shared memory region

C.1.3 Index into Shared Memory area by setting offset

```
llseek(fd, offset, SEEK_CUR);
```

C.1.4 Read

```
bytes_read = read(fd, (void *) buf, count)
```

Parameters:

fd – File descriptor returned by *open*
buf – empty buffer in which data will be copied
count – number of bytes that should be read as input parameter

Return Value:
bytes_read – number of bytes actually read

C.1.5 Write

```
bytes_written = write(fd, (void*) buf, count)
```

Parameters:

fd – File descriptor returned by *open*
buf – buffer containing data to write to shared memory
count – number of bytes that should be written. User supplies the count.

Return Value:

bytes_written – number of bytes actually written

C.1.6 Close

Close Shared Memory area with:

```
close(fd);
```

C.2 Windows Examples

Below are examples of how to use the APIs for Windows.

C.2.1 Additional Dependency Library (setupapi.lib)

Setupapi.lib

C.2.2 Open

```
DevicePath = GetDevicePath((LPGUID)&GUID_DEVINTERFACE_WRSHMEM);


hDevice = CreateFile(DevicePath,
          GENERIC_READ|GENERIC_WRITE,
          FILE_SHARE_READ | FILE_SHARE_WRITE,
          NULL,
          OPEN_EXISTING,
          0,
          NULL );


DevicePath = GetDevicePath((LPGUID)&GUID_DEVINTERFACE_WRSHMEM);
```

C.2.3 Read

```
SetFilePointer(hDevice, dataOffset, NULL, FILE_BEGIN);
Result = ReadFile(hDevice, readBuffer, dataLength, &bytesRead, NULL);
```

C.2.4 Write

```
SetFilePointer(hDevice, dataOffset, NULL, FILE_BEGIN);
Result = WriteFile (hDevice, writeBuffer, dataLength, &bytesWritten, NULL);
```

C.2.5 Includes

```
#include <DriverSpecs.h>
```

OR optionally use the parameters in the following section, *Define GUID*.

C.2.6 Define GUID

If you choose not to define the device path by **GetDevicePath**, then you must define GUID as follows:

```
#define WHILE(a) \
__pragma(warning(suppress:4127)) while(a)

//
// Define an Interface Guid so that app can find the device and
talk to it.
//

DEFINE_GUID (GUID_DEVINTERFACE_WRSHMEM,
    /* 4968ac3d-b46a-4bf0-afb3-95f659518ba8 */
    0x4968ac3d,
    0xb46a,
    0x4bf0,
    0xaf, 0xb3, 0x95, 0xf6, 0x59, 0x51, 0x8b, 0xa8);

//
// Device type           -- in the "User Defined" range."
//
#define FILEIO_TYPE 40001
//
// The IOCTL function codes from 0x800 to 0xFFF are for customer
use.
//
#define IOCTL_WRSHMEM_SHMEMSIZE \
    CTL_CODE( FILEIO_TYPE, 0xdef, METHOD_BUFFERED, FILE_ANY_ACCESS
)
```

After defining the GUID, you must also define a device path.

```
DevicePath = "\\\\?\\\\root#unknown#0000#{4968ac3d-b46a-4bf0-afb3-
95f659518ba8}";

hDevice = CreateFile(CA2W(DevicePath),
                          GENERIC_READ|GENERIC_WRITE,
                          FILE_SHARE_READ | FILE_SHARE_WRITE,
```

```
                                    NULL,
                                    OPEN_EXISTING,
                                    0,
                                    NULL );
```

C.2.7 Read

```
SetFilePointer(hDevice, dataOffset, NULL, FILE_BEGIN);
Result = ReadFile(hDevice, readBuffer, dataLength, &bytesRead,
NULL);
```

C.2.8 Write

```
SetFilePointer(hDevice, dataOffset, NULL, FILE_BEGIN);
Result = WriteFile (hDevice, writeBuffer, dataLength,
&bytesWritten, NULL);
```

C.3 Install Additional Components

C.3.1 Component 1

Install Visual Studio 2012 Update Pack 4 onto the development host.

C.3.2 Component 2

Install Redistributable Packages 2012 the target platform.

C.3.3 Component 3

Ensure .NET Framework 4.0.30319 is installed on the target platform project:

1. Go to **File > New > Project**.
2. Expand **Installed > Templates > Visual C++**.
3. Select **Win32**.
4. Choose **Win32 Console Application**.

5. Click **OK**.
6. Click **Finish**.
7. Add the source code and header file
    a. For the driver test app, add **wrshmem_test.cpp** and **public.h** to the project directory
    b. Import file:
        i. Right click the source files: Select **Add > Existing**, and Browse to **wrshemem_test.cpp**
        ii. Right click the header files: Select **Add > Existing**; and browse to **public.h**

8. Add x64 platform type
    a. Click **Build > Configuration Manager**.
    b. Click the drop-down menu below **Configuration**.
    c. Select **Release**.

c. 9. Build the project.

§

Appendix D – Technical Support

D.1 In-Product Technical Support

In the event you require support while using Intel® Industrial Solutions System Consolidation Series (SCS), we strongly recommend you first consult with the many resources provided to you as documentation in printed and electronic file format in the product packaging.

- For a document listing, go to Section 3 – Intel® Industrial Solutions System Consolidation Series Documentation.
- For self-help activities, see Appendix C – Troubleshooting.

D.2 Online and Live Technical Support

As an authorized Intel® Industrial Solutions System Consolidation Series (SCS) product owner, you are entitled to technical support as defined on the SCS product website. See the technical support statement at:

www.intel.com/industrialconsolidation

D.3 Wind River Product Support and Training

Portions of your Intel® Industrial Solutions System Consolidation Series (SCS) product are provided courtesy of Wind River. For support and training beyond that defined here, see Wind River's website:

www.windriver.com/company/contact

D.4 Microsoft* Windows* Product Support

For assistance with Windows*, refer to Windows resident help and www.microsoft.com.

§

Appendix E – Troubleshooting

CAUTION: Content within this section may include activities that entail risk to the preservation of data you may have accumulated in the course of your business activities. For example, in order to resolve a performance issue in your system, you may decide to follow the recommendation to reinstall all or part of the system software. In so doing, you may cause data that you may have accumulated in your system hard drive storage to be irretrievably destroyed. To avoid data loss, make certain to create full backups of your business data onto remote resources in accordance with your company's policies. Make certain to review other Safety content outlined in Section 2 – Safety Notice**.**

This section provides activities you may perform to resolve some issues while using the Intel® Industrial Solutions System Consolidation Series (SCS).

This chapter is arranged into subsections when issues commonly occur:

- **Installation –** Issues that may arise when setting up, connecting, and starting the system
- **Configuration –** Issues that may arise when developing target platform configurations for production

Review the items listed in the sections below for a description of your issue and perform the suggested troubleshooting activity to help resolve the issue. Also make certain to consult the references mentioned in Appendix D – Technical Support.

IMPORTANT: This content may be updated without notice. To ensure that you are reading the most recent document, check the product support website:

www.intel.com/industrialconsolidation

In the event that all immediately available troubleshooting and help does not resolve your issue, interactive support is available. For more information, go to www.intel.com/industrialconsolidation

IMPORTANT: Some Recommend Resolutions shown below instruct you to perform activities on the development host, and some on the target platform. Make certain that you distinguish between these two subsystems, and that you perform activities on the subsystem indicated.

E.1 Installation Troubleshooting

The following troubleshooting items are commonly related to system installation.

Table 4 - Installation Troubleshooting

Item #	Issue	Recommended Resolution
T0001	Development host **does not boot** from the **USB** media labeled *Development Host*.	Turn off the development host. Make certain the *Development Host* USB media is plugged into a functional USB port on the development host. Start the development host. As the development host starts up, invoke the development host BIOS menu. Configure the BIOS so that the development host boots from USB media upon next startup. Boot the development host from the *Development Host* USB media. If the development host still does not boot from the *Development Host* USB media, try using a different USB port, or try using different development host hardware.
T0002	When attempting to **install development host software** to the development host, the **"Install to Hard Drive"** icon does not appear.	Before you can install the development host software onto the development host, you must first license the *Development Host* USB media. The licensing process includes placement of a license file into a specific file directory. Make certain you place the file into the correct location and follow the instructions provided in Section 6.6- License the System. After placing the license file into the proper *Development Host* USB media directory and booting the development host from the USB media, it may take several minutes for the "Install to Hard Drive" icon to appear.

Item #	Issue	Recommended Resolution
T0003	When attempting to **install development host software** to the development host, the **installation takes too long**.	Installation time depends greatly upon the performance factors of the user-provided development host. These factors include processor speed, hard drive speed, and overall throughput among other factors. During testing on various development host hardware, Intel Corporation observed installation times ranging from 10 minutes to 2 hours. Generally, newer hardware systems require less installation time than older systems. Because software ideally only needs to be installed once, Intel Corporation recommends waiting until the system installs completely.
T0004	When attempting to **install development host software** onto the development host, the **installation hangs** or **fails**.	Make certain your development host hardware meets the minimum performance specifications defined in Section 4.1.2 – Development Host Specifications. If you determine you must install your development host software onto different hardware, you should first contact your Intel representative to nullify the old license and provide Host ID information for the new development host. See the licensing instructions in Section 6.6 - License the System.
T0005	When establishing an **AMIO connection** between the development host and target platform over **serial connection**, the development host and target platform **do not connect**.	Make certain you correctly set up the physical and logical connections between the development host and target platform. When starting up the development host and target platform and establishing a connection, make certain to start up the development host software first and establish an open connection on the development host AMIO console before starting the target platform. See Section 6.14- Connect the Target Platform and Development Hosts.

E.2 Configuration Troubleshooting

The following troubleshooting items are commonly related to system configuration.

Table 5 - Installation Troubleshooting

Item #	Issue	Recommended Resolution
T0006	When attempting to **boot the target platform** using the ***Target Platform*** **USB media**, the target platform **boots from the target platform hard drive** instead.	Every time you boot the target platform from USB media, you must configure the target platform BIOS settings to boot from USB media. After configuring the BIOS to boot from USB Media, this change is not persistent, and the system boots only *one time* from USB Media. On subsequent startups, the target platform boots from hard drive.
T0007	When attempting to **boot the target platform** using the ***Target Platform*** **USB media**, the **target platform hangs**.	Make certain the boot image file name is named **system.elf**. If the boot image has another name, rename it to **system.elf** and retry booting. The boot image on the *Target Platform* USB media may be corrupt. Recreate the image and try rebooting the target platform from it.
T0008	I load **customized code into my VxWorks/Linux project** and create a **new system.elf that I copy to USB**. After booting the target platform using the USB media with the image containing my customized code, the **code does not appear in the VxWorks/Linux OSes after the target platform boots**.	If the customized code does not appear upon booting up the target platform, the target platform likely did not boot from the USB media. Every time you boot the target platform from USB media, you must configure the target platform BIOS settings to boot from USB media. After configuring the BIOS to boot from USB Media, this change is not persistent, and the system boots only *one time* from USB Media. On subsequent startups, the target platform boots from hard drive.

Item #	Issue	Recommended Resolution
T0009	While using the development host software to **build a new Linux project from scratch**, the **build process takes too long**.	When frequently adding small portions of customized code or small components that require frequent recompiling of the Linux project, try using the **Rebuild** command instead the **Build** command. Rebuild recompiles the Linux project, adding only the differences you added since the last full project build. Using Rebuild can significantly reduce overall wait time as the project compiles. To further reduce build time, select fewer components and / or work with a development host with powerful processing capabilities. During testing on various development host hardware, Intel Corporation observed Linux project build times ranging from 15 minutes to 8 hours.
T0010	When **booting the target platform** from USB media containing a **system.elf** file I created using the development host software, not all **OSes boot up on the target platform**.	First confirm that you are actually booting the target platform from the USB media. See Troubleshooting item #T0006. Allow the target platform to restart form the USB boot media containing the **system.elf** file you wish to boot. In the development host AMIO pane, consoles for each OS should open. If all of the OS consoles do not appear within a few minutes after booting the target OS, then not all of the OS projects you created in the development host were integrated properly into the bootable **system.elf** file. Make certain you have followed the instructions in the *User Guide* chapters entitled *Develop With Preloaded Workbench Projects* or *Build Linux & VxWorks OS Images from Scratch*. These chapters provide instructions to ensure that all OS projects are properly compiled and integrated into a bootable **system.elf** file.

§

Appendix F – Legal Notices

F.1 All Notices

Make certain to read all information including legal notices before using the system. Information is available in printed and electronic formats from:

- this document, the *Intel® Industrial Solutions System Consolidation Series (SCS) User Guide*
- the *User Support* media USB
- the development host software system. See Section 3 – Intel® Industrial Solutions System Consolidation Series Documentation.
- Reference materials included those listed in Section 1.3 – Reference Content.
- www.Intel.com
- www.WindRiver.com
- your sales and support representatives

F.2 License Notices

Access an important *Wind River Linux 5.0 Third Party License Notices* document by going to the following relative path on the development host media:

```
…/home/wruser/WindRiver/legal-notices/wr-Linux-5.0.1/
WindRiver_Linux5.0_ThirdPartyNotices_v2.1.pdf
```

Access other license documents by going to the following relative path on the development host media:

```
…/home/wruser/WindRiver/licenses
```

IMPORTANT: Make certain to read important information regarding GNU General Public License version 3 (GPLv3) and GNU General Public License version 2 (GPLv2) in the *Wind River Linux User's Guide*, page 112. Access this document as an Adobe PDF file by going to the following relative path on the Development Host:

```
…/home/wruser/WindRiver/docs/extensions/eclipse/plugins/com.windriver
.ide.doc.wr_linux_5/wr_linux_users_guide/
wr_linux_users_guide_5.0.1.pdf
```

F.3 GNU General Public License

GNU GENERAL PUBLIC LICENSE

Version 3, 29 June 2007

Preamble

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